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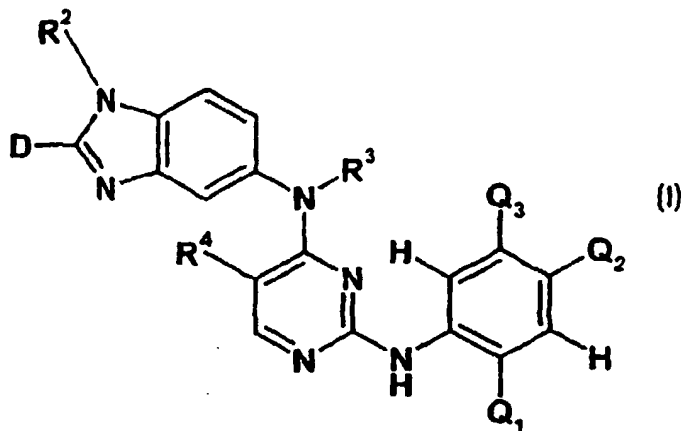
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(54) Title: DIAMINO-PYRIMIDINES AND THEIR USE AS ANGIOGENESIS INHIBITORS



(57) Abstract: Benzimidazole derivatives of formula (I), which are useful as TIE-2 and/or VEGFR-2 inhibitors are described herein. The described invention also includes methods of making such benzimidazole derivatives as well as methods of using the same in the treatment of hyperproliferative diseases. (I)

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## BACKGROUND OF THE INVENTION

5           The present invention relates to benzimidazole derivatives, compositions and medicaments containing the same, as well as processes for the preparation and use of such compounds, compositions and medicaments. Such benzimidazole derivatives are useful in the treatment of diseases associated with inappropriate angiogenesis.

10           The process of angiogenesis is the development of new blood vessels, generally capillaries, from pre-existing vasculature. Angiogenesis is defined as involving (i) activation of endothelial cells; (ii) increased vascular permeability; (iii) subsequent dissolution of the basement membrane and extravasation of plasma components leading to formation of a provisional fibrin gel extracellular matrix; (iv) proliferation  
15           and mobilization of endothelial cells; (v) reorganization of mobilized endothelial cells to form functional capillaries; (vi) capillary loop formation; and (vii) deposition of basement membrane and recruitment of perivascular cells to newly formed vessels. Normal angiogenesis is activated during tissue growth, from embryonic development through maturity, and then enters a period of relative quiescence during adulthood.  
20           Normal angiogenesis is also activated during wound healing, and at certain stages of the female reproductive cycle. Inappropriate angiogenesis has been associated with several disease states including various retinopathies; ischemic disease; atherosclerosis; chronic inflammatory disorders; and cancer. The role of angiogenesis in disease states is discussed, for instance, in Fan et al, Trends in Pharmacol Sci. 16:54-66; Shawver et  
25           al, DDT Vol. 2, No. 2 February 1997; Folkmann, 1995, Nature Medicine 1:27-31.

          In cancer, the growth of solid tumors has been shown to be angiogenesis dependent. (See Folkmann, J., J. Nat'l. Cancer Inst., 1990, 82, 4-6.) Consequently, the targeting of pro-angiogenic pathways in cancer treatment is a strategy being widely  
30           pursued in order to provide new therapeutics in these areas of great, unmet medical need. The role of tyrosine kinases involved in angiogenesis and in the vascularization of solid tumors has drawn interest. Until recently most interest in this area has

focused on growth factors such as vascular endothelial growth factor (VEGF) and its receptors termed vascular endothelial growth factor receptor(s) (VEGFR). VEGF, a polypeptide, is mitogenic for endothelial cells *in vitro* and stimulates angiogenic responses *in vivo*. VEGF has also been linked to inappropriate angiogenesis (Pinedo, H.M. et al The Oncologist, Vol. 5, No. 90001, 1-2, April 2000). VEGFR(s) are protein tyrosine kinases (PTKs). PTKs catalyze the phosphorylation of specific tyrosyl residues in proteins involved in the regulation of cell growth and differentiation. (A.F. Wilks, Progress in Growth Factor Research, 1990, 2, 97-111; S.A. Courtneidge, Dev. Suppl., 1993, 57-64; J.A. Cooper, Semin. Cell Biol., 1994, 5(6), 377-387; R.F. Paulson, Semin. Immunol., 1995, 7(4), 267-277; A.C. Chan, Curr. Opin. Immunol., 1996, 8(3), 394-401).

Three PTK receptors for VEGF have been identified: VEGFR-1 (Flt-1); VEGFR-2 (Flk-1 or KDR) and VEGFR-3 (Flt-4). These receptors are involved in angiogenesis and participate in signal transduction (Mustonen, T. et al J. Cell Biol. 1995;129:895-898). Of particular interest is VEGFR-2, which is a transmembrane receptor PTK expressed primarily in endothelial cells. Activation of VEGFR-2 by VEGF is a critical step in the signal transduction pathway that initiates tumor angiogenesis. VEGF expression may be constitutive to tumor cells and can also be upregulated in response to certain stimuli. One such stimuli is hypoxia, where VEGF expression is upregulated in both tumor and associated host tissues. The VEGF ligand activates VEGFR-2 by binding with its extracellular VEGF binding site. This leads to receptor dimerization of VEGFRs and autophosphorylation of tyrosine residues at the intracellular kinase domain of VEGFR-2. The kinase domain operates to transfer a phosphate from ATP to the tyrosine residues, thus providing binding sites for signaling proteins downstream of VEGFR-2 leading ultimately to initiation of angiogenesis (McMahon, G., The Oncologist, Vol. 5, No. 90001, 3-10, April 2000).

Angiopoietin 1 (Ang1), a ligand for the endothelium-specific receptor tyrosine kinase TIE-2, is a novel angiogenic factor (Davis et al, Cell, 1996, 87:1161-1169; Partanen et al, Mol. Cell Biol, 12:1698-1707 (1992); U.S. Patent Nos. 5,521,073; 5,879,672; 5,877,020; and 6,030,831). The acronym TIE represents "tyrosine kinase containing Ig and EGF homology domains". TIE is used to identify a class of receptor

tyrosine kinases, which are exclusively expressed in vascular endothelial cells and early hemopoietic cells. Typically, TIE receptor kinases are characterized by the presence of an EGF-like domain and an immunoglobulin (IG) like domain, which consists of extracellular folding units, stabilized by intra-chain disulfide bonds (Partanen et al  
5 Curr. Topics Microbiol. Immunol., 1999, 237:159-172). Unlike VEGF, which functions during the early stages of vascular development, Ang1 and its receptor TIE-2 function in the later stages of vascular development, i.e., during vascular remodeling (remodeling refers to formation of a vascular lumen) and maturation (Yancopoulos et al, Cell, 1998, 93:661-664; Peters, K.G., Circ. Res., 1998, 83(3):342-3; Suri et al, Cell 87,  
10 1171-1180 (1996)).

Consequently, inhibition of TIE-2 would be expected to serve to disrupt remodeling and maturation of new vasculature initiated by angiogenesis thereby disrupting the angiogenic process. Furthermore, inhibition at the kinase domain  
15 binding site of VEGFR-2 would block phosphorylation of tyrosine residues and serve to disrupt initiation of angiogenesis. Presumably then, inhibition of TIE-2 and/or VEGFR-2 should prevent tumor angiogenesis and serve to retard or eradicate tumor growth. Accordingly, a treatment for cancer or other disorders associated with inappropriate angiogenesis could be provided.

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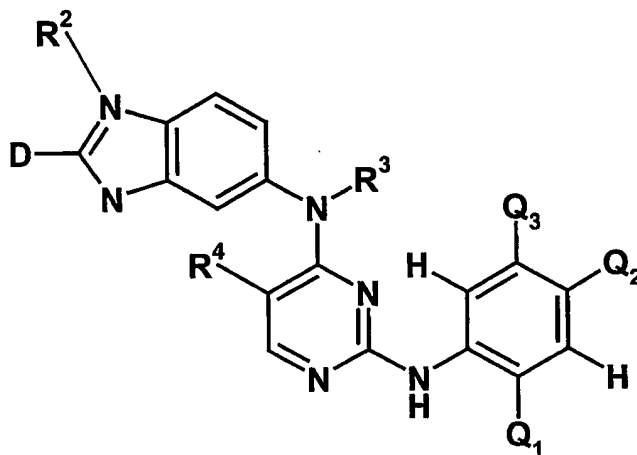
The present inventors have discovered novel benzimidazole compounds, which are inhibitors of TIE-2 and/or VEGFR-2 kinase activity. Such benzimidazole derivatives are useful in the treatment of disorders, including cancer, associated with inappropriate angiogenesis.

25



## BRIEF SUMMARY OF THE INVENTION

In one aspect of the present invention, there is provided a compound of Formula (I):



(I)

or a salt, solvate, or physiologically functional derivative thereof:

wherein:

D is  $-NRR^1$ ,  $-OR$ ,  $-SR$ ,  $-S(O)R$ , or  $-S(O)_2R$ ;

10 R is hydrogen,  $C_1$ - $C_8$  alkyl,  $C_3$ - $C_7$  cycloalkyl, aralkyl, aryl, heteroaryl,  $-C(O)NR^1R^1$ ,  $-C(O)OR^1$ , acyl, aroyl, or heteroaroyl;

$R^1$  is hydrogen,  $C_1$ - $C_8$  alkyl,  $C_3$ - $C_7$  cycloalkyl, aralkyl, or aryl;

$R^2$  is  $C_1$ - $C_6$  alkyl or  $C_3$ - $C_7$  cycloalkyl;

$R^3$  is hydrogen,  $C_1$ - $C_4$  alkyl,  $C_1$ - $C_4$  haloalkyl, aralkyl, cyanoalkyl,

15  $-(CH_2)_pC=CH(CH_2)_tH$ ,  $-(CH_2)_pC\equiv C(CH_2)_tH$ , or  $C_3$ - $C_7$  cycloalkyl;

p is 1, 2, or 3;

t is 0 or 1;

$R^4$  is hydrogen, halo, or cyano;

20  $Q_1$  is hydrogen, halo,  $C_1$ - $C_2$  haloalkyl,  $C_1$ - $C_2$  alkyl,  $C_1$ - $C_2$  alkoxy, or  $C_1$ - $C_2$  haloalkoxy;

$Q_2$  is  $A^1$  or  $A^2$ ;

$Q_3$  is  $A^1$  when  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^2$  when  $Q_2$  is  $A^1$ ;

wherein

$A^1$  is hydrogen, halo,  $C_1$ - $C_3$  alkyl,  $C_1$ - $C_3$  haloalkyl,  $-OR^5$ , and

25  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein

Z is CH<sub>2</sub> and m is 0, 1, 2, or 3, or

Z is NR<sup>5</sup> and m is 0 or 1, or

Z is oxygen and m is 0 or 1, or

Z is CH<sub>2</sub>NR<sup>6</sup> and m is 0 or 1;

5 Z<sup>1</sup> is S(O)<sub>2</sub>, S(O), or C(O); and

Z<sup>2</sup> is C<sub>1</sub>-C<sub>4</sub> alkyl, cycloalkyl, heterocyclyl, -NR<sup>8</sup>R<sup>9</sup>, aryl, arylamino, aralkyl, aralkoxy, or heteroaryl;

10 R<sup>5</sup> and R<sup>6</sup> are each independently selected from hydrogen, hydroxyl, alkoxy, aryloxy, aralkoxy, C<sub>1</sub>-C<sub>4</sub> alkyl, C<sub>3</sub>-C<sub>7</sub> cycloalkyl, heterocyclyl, -S(O)<sub>2</sub>R<sup>7</sup>, or -C(O)R<sup>7</sup>;

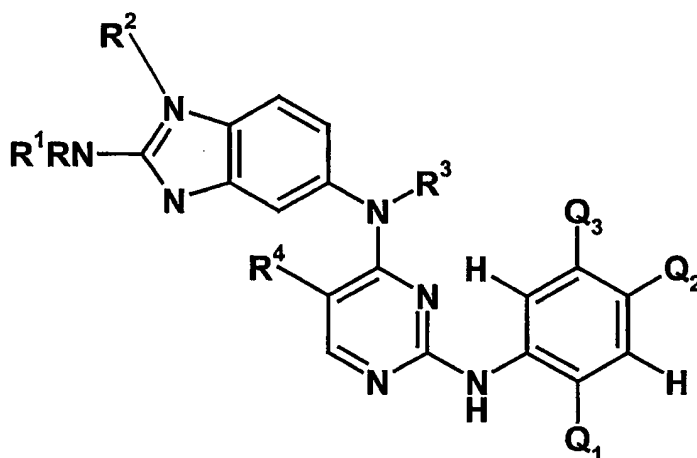
R<sup>7</sup> is C<sub>1</sub>-C<sub>4</sub> alkyl, or C<sub>3</sub>-C<sub>7</sub> cycloalkyl;

R<sup>8</sup> is hydrogen, hydroxyl, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, aryloxy, aralkoxy, C<sub>3</sub>-C<sub>7</sub> cycloalkyl, or C<sub>3</sub>-C<sub>7</sub> cycloalkoxy; and

R<sup>9</sup> is hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>3</sub>-C<sub>7</sub> cycloalkyl, aryl, acyl, carbamoyl, or heterocyclyl.

15

In a second aspect of the present invention, there is provided a compound of Formula (II):



(II)

20 or a salt, solvate, or physiologically functional derivative thereof:  
wherein:

R is hydrogen, C<sub>1</sub>-C<sub>8</sub> alkyl, C<sub>3</sub>-C<sub>7</sub> cycloalkyl, aralkyl, aryl, heteroaryl, -C(O)NR<sup>1</sup>R<sup>1</sup>, -C(O)OR<sup>1</sup>, acyl, aroyl, or heteroaroyl;

R<sup>1</sup> is hydrogen, C<sub>1</sub>-C<sub>8</sub> alkyl, C<sub>3</sub>-C<sub>7</sub> cycloalkyl, aralkyl, or aryl;

25 R<sup>2</sup> is C<sub>1</sub>-C<sub>6</sub> alkyl or C<sub>3</sub>-C<sub>7</sub> cycloalkyl;

$R^3$  is hydrogen,  $C_1$ - $C_4$  alkyl,  $C_1$ - $C_4$  haloalkyl, aralkyl, cyanoalkyl,  
 $-(CH_2)_pC=CH(CH_2)_tH$ ,  $-(CH_2)_pC\equiv C(CH_2)_tH$ , or  $C_3$ - $C_7$  cycloalkyl;

$p$  is 1, 2, or 3;

$t$  is 0 or 1;

5  $R^4$  is hydrogen, halo, or cyano;

$Q_1$  is hydrogen, halo,  $C_1$ - $C_2$  haloalkyl,  $C_1$ - $C_2$  alkyl,  $C_1$ - $C_2$  alkoxy, or  $C_1$ - $C_2$  haloalkoxy;

$Q_2$  is  $A^1$  or  $A^2$ ;

$Q_3$  is  $A^1$  when  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^2$  when  $Q_2$  is  $A^1$ ;

10 wherein

$A^1$  is hydrogen, halo,  $C_1$ - $C_3$  alkyl,  $C_1$ - $C_3$  haloalkyl,  $-OR^5$ , and

$A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein

$Z$  is  $CH_2$  and  $m$  is 0, 1, 2, or 3, or

$Z$  is  $NR^5$  and  $m$  is 0 or 1, or

15  $Z$  is oxygen and  $m$  is 0 or 1, or

$Z$  is  $CH_2NR^6$  and  $m$  is 0 or 1;

$Z^1$  is  $S(O)_2$ ,  $S(O)$ , or  $C(O)$ ; and

$Z^2$  is  $C_1$ - $C_4$  alkyl, cycloalkyl, heterocyclyl,  $-NR^8R^9$ , aryl, arylamino, aralkyl,  
 aralkoxy, or heteroaryl;

20

$R^5$  and  $R^6$  are each independently selected from hydrogen, hydroxyl, alkoxy, aryloxy,  
 aralkoxy,  $C_1$ - $C_4$  alkyl,  $C_3$ - $C_7$  cycloalkyl, heterocyclyl,  $-S(O)_2R^7$ , or  $-C(O)R^7$ ;

$R^7$  is  $C_1$ - $C_4$  alkyl, or  $C_3$ - $C_7$  cycloalkyl;

$R^8$  is hydrogen, hydroxyl,  $C_1$ - $C_6$  alkyl,  $C_1$ - $C_6$  alkoxy, aryloxy, aralkoxy,  $C_3$ - $C_7$  cycloalkyl, or

25  $C_3$ - $C_7$  cycloalkoxy; and

$R^9$  is hydrogen,  $C_1$ - $C_6$  alkyl,  $C_3$ - $C_7$  cycloalkyl, aryl, acyl, carbamoyl, or heterocyclyl.

In a third aspect of the present invention, there is provided a pharmaceutical  
 composition comprising a therapeutically effective amount of a compound of formula

30 (I) or a salt, solvate, or a physiologically functional derivative thereof and one or more  
 of pharmaceutically acceptable carriers, diluents and excipients.

In a fourth aspect of the present invention, there is provided a method of treating a disorder in a mammal, said disorder being mediated by at least one of inappropriate TIE-2 and VEGFR-2 activity, comprising: administering to said mammal a therapeutically effective amount of a compound of formula (I) or a salt, solvate or a physiologically functional derivative thereof.

In a fifth aspect of the present invention, there is provided a compound of formula (I), or a salt, solvate, or a physiologically functional derivative thereof for use in therapy.

In a sixth aspect of the present invention, there is provided the use of a compound of formula (I), or a salt, solvate, or a physiologically functional derivative thereof in the preparation of a medicament for use in the treatment of a disorder mediated by at least one of inappropriate TIE-2 and VEGFR-2 activity.

In a seventh aspect of the present invention, there is provided a method of treating a disorder in a mammal, said disorder being mediated by at least one of inappropriate TIE-2 and VEGFR-2 activity, comprising: administering to said mammal therapeutically effective amounts of (i) a compound of formula (I), or a salt, solvate or physiologically functional derivative thereof and (ii) an agent to inhibit growth factor receptor function.

In an eighth aspect of the present invention, there is provided a method of treating a disorder in a mammal, said disorder being characterized by inappropriate angiogenesis, comprising: administering to said mammal a therapeutically effective amount of a compound of formula (I), or a salt, solvate or physiologically functional derivative thereof.

#### DETAILED DESCRIPTION

As used herein, the term "effective amount" means that amount of a drug or pharmaceutical agent that will elicit the biological or medical response of a tissue,

system, animal or human that is being sought, for instance, by a researcher or clinician. Furthermore, the term "therapeutically effective amount" means any amount which, as compared to a corresponding subject who has not received such amount, results in improved treatment, healing, prevention, or amelioration of a disease, disorder, or side effect, or a decrease in the rate of advancement of a disease or disorder. The term also includes within its scope amounts effective to enhance normal physiological function.

As used herein the term "alkyl" refers to a straight or branched chain hydrocarbon radical having from one to twelve carbon atoms, optionally substituted with substituents selected from the group consisting of C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> hydroxyalkyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, C<sub>1</sub>-C<sub>6</sub> alkylsulfanyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfenyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfonyl, oxo, hydroxy, mercapto, amino optionally substituted by alkyl, carboxy, carbamoyl optionally substituted by alkyl, aryl, aryloxy, heteroaryl, aminosulfonyl optionally substituted by alkyl, nitro, cyano, halogen, or C<sub>1</sub>-C<sub>6</sub> perfluoroalkyl, multiple degrees of substitution being allowed. Examples of "alkyl" as used herein include, but are not limited to, methyl, ethyl, n-propyl, isopropyl, n-butyl, isobutyl, t-butyl, n-pentyl, isopentyl, and the like.

As used herein, the terms "C<sub>1</sub>-C<sub>3</sub> alkyl", "C<sub>1</sub>-C<sub>4</sub> alkyl", "C<sub>1</sub>-C<sub>6</sub> alkyl" and "C<sub>1</sub>-C<sub>8</sub> alkyl" refer to an alkyl group, as defined above, containing at least 1, and at most 3, 4, 6, or 8, carbon atoms respectively. Examples of such branched or straight-chained alkyl groups useful in the present invention include, but are not limited to, methyl, ethyl, n-propyl, isopropyl, isobutyl, n-butyl, t-butyl, n-pentyl, isopentyl, n-hexyl, and n-septyl.

As used herein, the term "alkylene" refers to a straight or branched chain divalent hydrocarbon radical having from one to ten carbon atoms, optionally substituted with substituents selected from the group which includes C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, C<sub>1</sub>-C<sub>6</sub> alkylsulfanyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfenyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfonyl, oxo, hydroxy, mercapto, amino optionally substituted by alkyl, carboxy, carbamoyl optionally substituted by alkyl, aminosulfonyl optionally substituted by alkyl, nitro, cyano,

halogen and C<sub>1</sub>-C<sub>6</sub> perfluoroalkyl, multiple degrees of substitution being allowed. Examples of "alkylene" as used herein include, but are not limited to, methylene, ethylene, n-propylene, n-butylene, and the like.

5           As used herein, the term "C<sub>1</sub>-C<sub>3</sub> alkylene" refers to an alkylene group, as defined above, which contains at least 1, and at most 3, carbon atoms respectively. Examples of "C<sub>1</sub>-C<sub>3</sub> alkylene" groups useful in the present invention include, but are not limited to, methylene, ethylene, and n-propylene.

10           As used herein, the term "halogen" refers to fluorine (F), chlorine (Cl), bromine (Br), or iodine (I) and the term "halo" refers to the halogen radicals fluoro (-F), chloro (-Cl), bromo(-Br), and iodo(-I).

          As used herein, the terms "C<sub>1</sub>-C<sub>2</sub> haloalkyl", "C<sub>1</sub>-C<sub>3</sub> haloalkyl", "C<sub>1</sub>-C<sub>4</sub> haloalkyl",  
15       and "C<sub>1</sub>-C<sub>6</sub> haloalkyl" refer to an alkyl group as defined above containing at least 1, and at most 2, 3, 4, or 6, carbon atoms respectively substituted with at least one halo group, halo being as defined herein. Examples of such branched or straight chained haloalkyl groups useful in the present invention include, but are not limited to, methyl, ethyl, propyl, isopropyl, isobutyl and n-butyl substituted independently with  
20       one or more halos, e.g., fluoro, chloro, bromo and iodo.

          As used herein, the term "cycloalkyl" refers to a non-aromatic cyclic hydrocarbon ring. In a like manner the term "C<sub>3</sub>-C<sub>7</sub> cycloalkyl" refers to a non-aromatic cyclic hydrocarbon ring having from three to seven carbon atoms and which  
25       optionally includes a C<sub>1</sub>-C<sub>6</sub> alkyl linker through which it may be attached. The C<sub>1</sub>-C<sub>6</sub> alkyl group is as defined above. Exemplary "C<sub>3</sub>-C<sub>7</sub> cycloalkyl" groups useful in the present invention include, but are not limited to, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl and cycloheptyl.

30           As used herein, the term "heterocyclic" or the term "heterocyclyl" refers to a three to twelve-membered non-aromatic heterocyclic ring, being saturated or having one or more degrees of unsaturation, containing one or more heteroatom

substitutions selected from S, S(O), S(O)<sub>2</sub>, O, or N, optionally substituted with substituents selected from the group consisting of C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, C<sub>1</sub>-C<sub>6</sub> alkylsulfanyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfenyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfonyl, oxo, hydroxy, mercapto, amino optionally substituted by alkyl, carboxy, carbamoyl optionally substituted by alkyl, aminosulfonyl optionally substituted by alkyl, nitro, cyano, halogen, or C<sub>1</sub>-C<sub>6</sub> perfluoroalkyl, multiple degrees of substitution being allowed. Such a ring may be optionally fused to one or more other "heterocyclic" ring(s) or cycloalkyl ring(s). Examples of "heterocyclic" moieties include, but are not limited to, tetrahydrofuran, pyran, 1,4-dioxane, 1,3-dioxane, piperidine, piperazine, 2,4-piperazinedione, pyrrolidine, imidazolidine, pyrazolidine, morpholine, thiomorpholine, tetrahydrothiopyran, tetrahydrothiophene, and the like.

As used herein, the term "aryl" refers to an optionally substituted benzene ring or to an optionally substituted benzene ring system fused to one or more optionally substituted benzene rings to form, for example, anthracene, phenanthrene, or naphthalene ring systems. Exemplary optional substituents include C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, C<sub>1</sub>-C<sub>6</sub> haloalkyl, C<sub>1</sub>-C<sub>6</sub> haloalkoxy, C<sub>1</sub>-C<sub>6</sub> alkylsulfanyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfenyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfonyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfonylamino, arylsulfonylamino, alkylcarboxy, alkylcarboxamide, oxo, hydroxy, mercapto, amino optionally substituted by alkyl or acyl, carboxy, tetrazolyl, carbamoyl optionally substituted by alkyl, aryl, or heteroaryl, aminosulfonyl optionally substituted by alkyl, acyl, aroyl, aroylamino, heteroaroyl, acyloxy, aroyloxy, heteroaroyloxy, alkoxycarbonyl, nitro, cyano, halogen, heteroaryl, heterocyclyl, aryl optionally substituted with aryl, halogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> haloalkyl, or C<sub>1</sub>-C<sub>6</sub> alkylsulfonyl, ureido, arylurea, alkylurea, cycloalkylurea, alkylthiourea, aryloxy, or aralkoxy, multiple degrees of substitution being allowed. Examples of "aryl" groups include, but are not limited to, phenyl, 2-naphthyl, 1-naphthyl, biphenyl, as well as substituted derivatives thereof.

As used herein, the term "aralkyl" refers to an aryl or heteroaryl group, as defined herein, attached through a C<sub>1</sub>-C<sub>3</sub> alkylene linker, wherein the C<sub>1</sub>-C<sub>3</sub> alkylene is as defined herein. Examples of "aralkyl" include, but are not limited to, benzyl, phenylpropyl, 2-pyridylmethyl, 3-isoxazolylmethyl, 5-methyl, 3-isoxazolylmethyl, and 2-imidazolyl ethyl.

As used herein, the term "heteroaryl" refers to a monocyclic five to seven membered aromatic ring, or to a fused bicyclic or tricyclic aromatic ring system comprising two of such monocyclic five to seven membered aromatic rings. These heteroaryl rings contain one or more nitrogen, sulfur, and/or oxygen heteroatoms, where N-oxides and sulfur oxides and dioxides are permissible heteroatom substitutions and may be optionally substituted with up to three members selected from a group consisting of C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, C<sub>1</sub>-C<sub>6</sub> alkylsulfanyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfenyl, C<sub>1</sub>-C<sub>6</sub> alkylsulfonyl, oxo, hydroxy, mercapto, amino optionally substituted by alkyl, carboxy, tetrazolyl, carbamoyl optionally substituted by alkyl, aminosulfonyl optionally substituted by alkyl, acyl, aroyl, heteroaroyl, acyloxy, aroyloxy,



heteroaryloxy, alkoxycarbonyl, nitro, cyano, halogen, C<sub>1</sub>-C<sub>6</sub> perfluoroalkyl, heteroaryl, or aryl, multiple degrees of substitution being allowed. Examples of "heteroaryl" groups used herein include furanyl, thiophenyl, pyrrolyl, imidazolyl, pyrazolyl, triazolyl, tetrazolyl, thiazolyl, oxazolyl, isoxazolyl, oxadiazolyl, oxo-pyridyl, thiadiazolyl, isothiazolyl, pyridyl, pyridazyl, pyrazinyl, pyrimidyl, quinoliny, isoquinoliny, benzofuranyl, benzothiophenyl, indolyl, indazolyl, and substituted versions thereof.

As used herein, the term "alkoxy" refers to the group R<sub>a</sub>O-, where R<sub>a</sub> is alkyl as defined above and the term "C<sub>1</sub>-C<sub>6</sub> alkoxy" refers to an alkoxy group as defined herein wherein the alkyl moiety contains at least 1, and at most 6, carbon atoms. Exemplary C<sub>1</sub>-C<sub>6</sub> alkoxy groups useful in the present invention include, but are not limited to, methoxy, ethoxy, n-propoxy, isopropoxy, n-butoxy, and t-butoxy.

As used herein, the term "amino" refers to the group -NH<sub>2</sub>.

As used herein the term "alkylamino" refers to the group -NHR<sub>a</sub> wherein R<sub>a</sub> is alkyl as defined above.

As used herein the term "arylamino" refers to the group -NHR<sub>a</sub> wherein R<sub>a</sub> is aryl as defined above.

As used herein the term "aralkylamino" refers to the group -NHR<sub>a</sub> wherein R<sub>a</sub> is an aralkyl group as defined above.

As used herein the term "aralkoxy" refers to the group R<sub>b</sub>R<sub>a</sub>O-, where R<sub>a</sub> is alkylene and R<sub>b</sub> is aryl or heteroaryl all as defined above.

As used herein the term "aryloxy" refers to the group R<sub>a</sub>O-, where R<sub>a</sub> is aryl or heteroaryl both as defined above.

As used herein the term "ureido" refers to the group -NHC(O)NH<sub>2</sub>

As used herein, the term "arylurea" refers to the group  $\text{-NHC(O)NHR}_a$  wherein  $R_a$  is aryl as defined above.

As used herein, the term "arylthiourea" refers to the group  $\text{-NHC(S)NHR}_a$  wherein  $R_a$  is aryl as defined above.

As used herein, the term "alkylurea" refers to the group  $\text{-NHC(O)NHR}_a$  wherein  $R_a$  is alkyl as defined above.

As used herein, the term "cycloalkylurea" refers to the group  $\text{-NHC(O)NHR}_a$  wherein  $R_a$  is cycloalkyl as defined above.

As used herein, the term " $\text{C}_3\text{-C}_7$  cycloalkoxy" refers to the group  $R_a\text{O-}$ , where  $R_a$  is  $\text{C}_3\text{-C}_7$  cycloalkyl as defined above. Exemplary  $\text{C}_3\text{-C}_7$  cycloalkoxy groups useful in the present invention include, but are not limited to, cyclobutoxy, and cyclopentoxo.

As used herein, the term "haloalkoxy" refers to the group  $R_a\text{O-}$ , where  $R_a$  is haloalkyl as defined above and the term " $\text{C}_1\text{-C}_6$  haloalkoxy" refers to a haloalkoxy group as defined herein wherein the haloalkyl moiety contains at least 1, and at most 6, carbon atoms. Exemplary  $\text{C}_1\text{-C}_6$  haloalkoxy groups useful in the present invention include, but is not limited to, trifluoromethoxy.

As used herein, the term "alkylsulfanyl" refers to the group  $R_a\text{S-}$ , where  $R_a$  is alkyl as defined above and the term " $\text{C}_1\text{-C}_6$  alkylsulfanyl" refers to an alkylsulfanyl group as defined herein wherein the alkyl moiety contains at least 1, and at most 6, carbon atoms.

As used herein, the term "haloalkylsulfanyl" refers to the group  $R_a\text{S-}$ , where  $R_a$  is haloalkyl as defined above and the term " $\text{C}_1\text{-C}_6$  haloalkylsulfanyl" refers to a haloalkylsulfanyl group as defined herein wherein the alkyl moiety contains at least 1, and at most 6, carbon atoms.

As used herein, the term "alkylsulfenyl" refers to the group  $R_aS(O)-$ , where  $R_a$  is alkyl as defined above and the term "C<sub>1</sub>-C<sub>6</sub> alkylsulfenyl" refers to an alkylsulfenyl group as defined herein wherein the alkyl moiety contains at least 1, and at most 6, carbon atoms.

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As used herein, the term "alkylsulfonyl" refers to the group  $R_aS(O)_2-$ , where  $R_a$  is alkyl as defined above and the term "C<sub>1</sub>-C<sub>6</sub> alkylsulfonyl" refers to an alkylsulfonyl group as defined herein wherein the alkyl moiety contains at least 1, and at most 6, carbon atoms.

10

As used herein, the term "alkylsulfonylamino" refers to the group  $-NHS(O)_2R_a$  wherein  $R_a$  is alkyl as defined above and the term "C<sub>1</sub>-C<sub>6</sub> alkylsulfonylamino" refers to an alkylsulfonylamino group as defined herein wherein the alkyl moiety contains at least 1, and at most 6, carbon atoms.

15

As used herein, the term "arylsulfonylamino" refers to the group  $-NHS(O)_2R_a$  wherein  $R_a$  is aryl as defined above.

As used herein, the term "alkylcarboxamide" refers to the group  $-NHC(O)R_a$  wherein  $R_a$  is alkyl, amino, or amino substituted with alkyl, aryl or heteroaryl as described above.

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As used herein the term "alkylcarboxy" refers to the group  $-C(O)R_a$  wherein  $R_a$  is alkyl as described above.

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As used herein, the term "oxo" refers to the group  $=O$ .

As used herein, the term "mercapto" refers to the group  $-SH$ .

30

As used herein, the term "carboxy" refers to the group  $-C(O)OH$ .

As used herein, the term "cyano" refers to the group  $-CN$ .

As used herein the term "cyanoalkyl" refers to the group  $\text{-CNR}_a$ , wherein  $R_a$  is alkyl as defined above. Exemplary "cyanoalkyl" groups useful in the present invention include, but are not limited to, cyanomethyl, cyanoethyl, and cyanoisopropyl.

5

As used herein, the term "aminosulfonyl" refers to the group  $\text{-S(O)}_2\text{NH}_2$ .

As used herein, the term "carbamoyl" refers to the group  $\text{-C(O)NH}_2$ .

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As used herein, the term "sulfanyl" shall refer to the group  $\text{-S-}$ .

As used herein, the term "sulfenyl" shall refer to the group  $\text{-S(O)-}$ .

15

As used herein, the term "sulfonyl" shall refer to the group  $\text{-S(O)}_2\text{-}$  or  $\text{-SO}_2\text{-}$ .

As used herein, the term "acyl" refers to the group  $\text{R}_a\text{C(O)-}$ , where  $R_a$  is alkyl, cycloalkyl, or heterocyclyl as defined herein.

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As used herein, the term "aroyl" refers to the group  $\text{R}_a\text{C(O)-}$ , where  $R_a$  is aryl as defined herein.

As used herein, the term "aroylamino" refers to the group  $\text{R}_a\text{C(O)NH-}$ , where  $R_a$  is aryl as defined herein.

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As used herein, the term "heteroaroyl" refers to the group  $\text{R}_a\text{C(O)-}$ , where  $R_a$  is heteroaryl as defined herein.

As used herein, the term "alkoxycarbonyl" refers to the group  $\text{R}_a\text{OC(O)-}$ , where  $R_a$  is alkyl as defined herein.

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As used herein, the term "acyloxy" refers to the group  $R_aC(O)O-$ , where  $R_a$  is alkyl, cycloalkyl, or heterocyclyl as defined herein.

As used herein, the term "aroyloxy" refers to the group  $R_aC(O)O-$ , where  $R_a$  is aryl as defined herein.

As used herein, the term "heteroaroyloxy" refers to the group  $R_aC(O)O-$ , where  $R_a$  is heteroaryl as defined herein.

As used herein, the term "optionally" means that the subsequently described event(s) may or may not occur, and includes both event(s), which occur, and events that do not occur.

As used herein, the term "physiologically functional derivative" refers to any pharmaceutically acceptable derivative of a compound of the present invention, for example, an ester or an amide, which upon administration to a mammal is capable of providing (directly or indirectly) a compound of the present invention or an active metabolite thereof. Such derivatives are clear to those skilled in the art, without undue experimentation, and with reference to the teaching of Burger's Medicinal Chemistry And Drug Discovery, 5<sup>th</sup> Edition, Vol 1: Principles and Practice, which is incorporated herein by reference to the extent that it teaches physiologically functional derivatives.

As used herein, the term "solvate" refers to a complex of variable stoichiometry formed by a solute (in this invention, a compound of formula (I) or a salt or physiologically functional derivative thereof) and a solvent. Such solvents for the purpose of the invention may not interfere with the biological activity of the solute. Examples of suitable solvents include, but are not limited to, water, methanol, ethanol and acetic acid. Preferably the solvent used is a pharmaceutically acceptable solvent. Examples of suitable pharmaceutically acceptable solvents include, without limitation, water, ethanol and acetic acid. Most preferably the solvent used is water.

As used herein, the term "substituted" refers to substitution with the named substituent or substituents, multiple degrees of substitution being allowed unless otherwise stated.

5           Certain of the compounds described herein may contain one or more chiral atoms, or may otherwise be capable of existing as two enantiomers. The compounds of this invention include mixtures of enantiomers as well as purified enantiomers or enantiomerically enriched mixtures. Also included within the scope of the invention are the individual isomers of the compounds represented by formula (I) above as well  
10 as any wholly or partially equilibrated mixtures thereof. The present invention also covers the individual isomers of the compounds represented by the formulas above as mixtures with isomers thereof in which one or more chiral centers are inverted. Also, it is understood that any tautomers and mixtures of tautomers of the compounds of formula (I) are included within the scope of the compounds of formula (I).

15

It is to be understood that reference to compounds of formula (I) and (II) above, following herein, refers to compounds within the scope of formula (I) and (II) as defined above with respect to D, Q<sub>1</sub>, Q<sub>2</sub>, Q<sub>3</sub>, A<sup>1</sup>, A<sup>2</sup>, Z, Z<sup>1</sup>, Z<sup>2</sup>, R<sup>1</sup>, R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup>, R<sup>5</sup>, R<sup>6</sup>, R<sup>7</sup>, R<sup>8</sup>, and R<sup>9</sup> unless specifically limited otherwise.

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In one embodiment, D is -NRR<sup>1</sup>. In one embodiment, D is -NRR<sup>1</sup>, wherein R is C<sub>1</sub>-C<sub>8</sub> alkyl, aryl, or aralkyl and R<sup>1</sup> is hydrogen. In a preferred embodiment, D is -NRR<sup>1</sup>, wherein R is methyl, isopropyl, benzyl, or phenyl and R<sup>1</sup> is hydrogen. In another embodiment, D is -NRR<sup>1</sup>, wherein R is hydrogen, C<sub>1</sub>-C<sub>8</sub> alkyl, C<sub>3</sub>-C<sub>7</sub> cycloalkyl. In  
25 another embodiment, D is -NRR<sup>1</sup>, wherein R is C<sub>3</sub>-C<sub>7</sub> cycloalkyl. In a further embodiment, D is -NRR<sup>1</sup>, wherein R is -C(O)NR<sup>1</sup>R<sup>1</sup>. In another embodiment, D is -NRR<sup>1</sup>, wherein R is C(O)OR<sup>1</sup>. In still another embodiment, D is -NRR<sup>1</sup>, wherein R is acyl. In another embodiment, D is -NRR<sup>1</sup>, wherein R is aroyl. In still another embodiment, D is -NRR<sup>1</sup>, wherein R is heteroaroyl.

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In one embodiment, R<sup>2</sup> is C<sub>1</sub>-C<sub>8</sub> alkyl. In a preferred embodiment, R<sup>2</sup> is methyl.

In one embodiment,  $R^3$  is hydrogen,  $C_1$ - $C_4$  alkyl, cyanoalkyl, or  $-(CH_2)_pC\equiv C(CH_2)_tH$ . In a preferred embodiment,  $R^3$  is hydrogen, methyl, ethyl, isopropyl, cyanomethyl, or  $-(CH_2)_pC\equiv C(CH_2)_tH$ , wherein  $p$  is 1 and  $t$  is 0. In a more preferred embodiment,  $R^3$  is methyl.

5

In one embodiment,  $R^4$  is hydrogen or halo. In a preferred embodiment,  $R^4$  is hydrogen.

10 In another embodiment,  $Q_1$  is hydrogen, halo,  $C_1$ - $C_2$  alkyl or  $C_1$ - $C_2$  alkoxy. In a preferred embodiment,  $Q_1$  is hydrogen, chloro, methyl, or methoxy.

In one embodiment,  $Q_2$  is  $A^1$  and  $Q_3$  is  $A^2$ . In an alternative embodiment,  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^1$ .

15 In one embodiment,  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^1$ , wherein  $A^1$  is hydrogen, halo, or  $C_1$ - $C_3$  haloalkyl and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein  $Z$  is  $CH_2$  and  $m$  is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is  $C_1$ - $C_4$  alkyl or  $NR^8R^9$  and wherein  $R^8$  is hydrogen  $C_1$ - $C_4$ alkyl, or alkoxy and  $R^9$  is hydrogen,  $C_1$ - $C_4$ alkyl, or alkoxy. In a preferred embodiment,  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^1$ , wherein  $A^1$  is hydrogen or chloro and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein  $Z$  is  $CH_2$  and  $m$  is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is methyl or  $-NH_2$ .

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In one embodiment,  $Q_2$  is  $A^1$  and  $Q_3$  is  $A^2$ , wherein  $A^1$  is hydrogen, halo, or  $C_1$ - $C_3$  alkyl and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein  $Z$  is  $CH_2$  and  $m$  is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is  $C_1$ - $C_4$  alkyl or  $NR^8R^9$ , and wherein  $R^8$  is hydrogen  $C_1$ - $C_4$ alkyl, or alkoxy and  $R^9$  is hydrogen,  $C_1$ - $C_4$ alkyl, or alkoxy. In a preferred embodiment,  $Q_2$  is  $A^1$  and  $Q_3$  is  $A^2$ , wherein  $A^1$  is hydrogen, methyl, or chloro and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein  $Z$  is  $CH_2$  and  $m$  is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is  $NR^8R^9$ , wherein  $R^8$  is methoxy and  $R^9$  is hydrogen.

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30 In a preferred embodiment,  $D$  is  $-NRR^1$ , wherein  $R$  is  $C_1$ - $C_8$  alkyl, aryl, or aralkyl and  $R^1$  is hydrogen;  $R^2$  is  $C_1$ - $C_8$  alkyl.  $R^2$  is methyl;  $R^3$  is methyl;  $R^4$  is hydrogen;  $Q_1$  is hydrogen, chloro, methyl, or methoxy;  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^1$ , wherein  $A^1$  is hydrogen or

chloro and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein Z is  $CH_2$  and m is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is methyl or  $-NH_2$ .

In a preferred embodiment, D is  $-NRR^1$ , wherein R is  $C_1-C_8$  alkyl, aryl, or aralkyl and  $R^1$  is hydrogen;  $R^2$  is  $C_1-C_8$  alkyl.  $R^2$  is methyl;  $R^3$  is methyl;  $R^4$  is hydrogen;  $Q_1$  is hydrogen, chloro, methyl, or methoxy;  $Q_2$  is  $A^1$  and  $Q_3$  is  $A^2$ , wherein  $A^1$  is hydrogen, methyl, or chloro and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein Z is  $CH_2$  and m is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is  $NR^8R^9$ , wherein  $R^8$  is methoxy and  $R^9$  is hydrogen.

Specific examples of compounds of the present invention include the following:

$N^6$ -Isopropyl- $N^5$ ,1-dimethyl- $N^5$ -[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1H-benzimidazole-2,5-diamine;

$N^6$ -Isopropyl- $N^5$ ,1-dimethyl- $N^5$ -[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1H-benzimidazole-2,5-diamine;

1-({4-[(4-{Methyl[1-methyl-2-(methylamino)-1H-benzimidazol-5-yl]amino}pyrimidin-2-yl)amino]phenyl}methanesulfonamide;

$N^6$ -benzyl- $N^5$ ,1-dimethyl- $N^5$ -[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1H-benzimidazole-2,5-diamine;

$N^5$ ,1-Dimethyl- $N^5$ -[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]- $N^6$ -phenyl-1H-benzimidazole-2,5-diamine; and

5-({4-[[2-(Benzylamino)-1-methyl-1H-benzimidazol-5-yl](methyl)amino]pyrimidin-2-yl}amino)-N-methoxy-2-methylbenzenesulfonamide;

or a salt, solvate, or physiologically functional derivative thereof.

Further specific examples of compounds of the present invention include the following:

3-({4-[(2-benzylamino-1-methyl-1H-benzimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

5-({4-[(2-benzylamino-1-methyl-1H-benzimidazol-5-yl)-methyl-amino]-pyrimidinylamino}-2-methyl-benzenesulfonamide;



- (4-{4-[(2-benzylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;
- 5 2-(4-{4-[(2-benzylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide;
- 3-(4-{[2-(4-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;
- 10 5-(4-{[2-(4-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;
- 15 *N*<sup>2</sup>-(4-fluoro-benzyl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;
- [4-(4-{[2-(4-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;
- 20 2-[4-(4-{[2-(4-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide;
- 3-(4-{[2-(4-methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;
- 25 5-(4-{[2-(4-methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;
- 30 *N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>2</sup>-(4-methoxy-benzyl)-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;
- [4-(4-{[2-(4-methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;
- 35 2-[4-(4-{[2-(4-methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide;
- 5-(4-{[2-(3-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;
- 40 3-(4-{[2-(3-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;
- 45 *N*<sup>2</sup>-(3-fluoro-benzyl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

- [4-(4-{[2-(3-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;
- 5 2-[4-(4-{[2-(3-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide;
- 3-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;
- 10 5-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;
- 2-[4-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide;
- 15 *N*<sup>2</sup>-(4-chloro-benzyl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;
- 3-{4-[(2-benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;
- 20 5-{4-[(2-benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-2-methyl-benzenesulfonamide;
- 25 *N*<sup>2</sup>-benzyl-1-ethyl-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>5</sup>-methyl-1H-benzoimidazole-2,5-diamine;
- (4-{4-[(2-benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;
- 30 3-(4-{[2-(2-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylmethyl)-benzenesulfonamide;
- 5-(4-{[2-(2-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;
- 35 [4-(4-{[2-(2-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;
- 40 2-(4-{4-[(2-benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide;
- 3-(4-{methyl-[1-methyl-2-(1-phenyl-ethylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;
- 45 2-methyl-5-(4-{methyl-[1-methyl-2-(1-phenyl-ethylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine;
- 5 [4-(4-{methyl-[1-methyl-2-(1-phenyl-ethylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;
- 3-(4-{[2-(3-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;
- 10 3-(4-{[2-(3-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;
- 15 [4-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;
- methanesulfonic acid-3-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl ester;
- 20  $N^5$ -{2-[4-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxy-benzyl)-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;
- $N^5$ -{2-[3-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxy-benzyl)-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;
- 25  $N^5$ -{2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxy-benzyl)-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;
- 30  $N^5$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^2$ -(4-methoxy-benzyl)-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;
- $N^2$ -benzyl- $N^5$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;
- 35  $N^5$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine;
- $N^5$ -{2-[3-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,  $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine;
- 40  $N^5$ -{2-[4-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,  $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine;
- 2-methyl-5-(4-{methyl-[1-methyl-2-(4-methyl-benzylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;
- 45  $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine;

$N^5$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine;

5  $N^5$ -{2-[4-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,  $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine;

$N^5$ -{2-[3-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,  $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine; and

10  $N^5$ -{2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,  $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine;

or a salt, solvate, or physiologically functional derivative thereof.

Still further specific examples of compounds of the present invention include the following:

15 (1-methyl-5-{methyl-[2-(3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-phenyl-carbamic acid tert-butyl ester;

20 3-{4-[methyl-(1-methyl-2-phenylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

(1-methyl-5-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-phenyl-carbamic acid tert-butyl ester;

25  $N^5$ -[2-(3-methanesulfonyl-4-methyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl- $N^2$ -phenyl-1H-benzoimidazole-2,5-diamine;

30  $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl- $N^2$ -phenyl-1H-benzoimidazole-2,5-diamine;

(4-{4-[methyl-(1-methyl-2-phenylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;

35 methanesulfonic acid 4-{4-[methyl-(1-methyl-2-phenylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl ester;

3-(4-{2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

40 5-(4-{2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;

- $N^2$ -(4-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^6$ -dimethyl-1H-benzoimidazole-2,5-diamine;
- 5 [4-(4-{[2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;
- methanesulfonic acid 4-(4-{[2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl ester;
- 10 methanesulfonic acid 3-(4-{[2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl ester;
- $N^6$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^6$ -dimethyl- $N^2$ -p-tolyl-1H-benzoimidazole-2,5-diamine;
- 15 [4-(4-{[2-(4-tert-butyl-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;
- 3-(4-{[2-(4-tert-butyl-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;
- 20 5-(4-{[2-(4-tert-butyl-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;
- 25  $N^2$ -(4-tert-butyl-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^6$ -dimethyl-1H-benzoimidazole-2,5-diamine;
- (5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester;
- 30  $N^6$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^2$ -(4-methoxy-phenyl)-1,  $N^6$ -dimethyl-1H-benzoimidazole-2,5-diamine;
- (4-methoxy-phenyl)-(1-methyl-5-{methyl-[2-(4-sulfamoylmethyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-carbamic acid tert-butyl ester;
- 35 [4-(4-{[2-(4-methoxy-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;
- 40 (5-{[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester;
- $N^6$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^2$ -(4-methoxy-phenyl)-1,  $N^6$ -dimethyl-1H-benzoimidazole-2,5-diamine;
- 45 [5-({2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-methyl-amino)-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester;

$N^5$ -{2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxy-phenyl)-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine; and

5  $N^5$ -{2-[3-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxy-phenyl)-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

or a salt, solvate, or physiologically functional derivative thereof.

Additional specific examples of compounds of the present invention include  
10 the following:

3-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

15 2-chloro-5-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

5-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-2-methyl-benzenesulfonamide;

20 2-(4-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide;

methanesulfonic acid 4-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl ester;

25 methanesulfonic acid 3-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl ester;

30  $N^2$ -isopropyl- $N^5$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

3-[4-(1-methyl-2-phenethylamino-1H-benzoimidazol-5-ylamino)-pyrimidin-2-ylamino]-benzenesulfonamide;

35 2-methyl-5-{4-[methyl-(1-methyl-2-phenethylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

(4-{4-[methyl-(1-methyl-2-phenethylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;

40  $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl- $N^2$ -phenethyl-1H-benzoimidazole-2,5-diamine;

45 2-(4-{4-[methyl-(1-methyl-2-phenethylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide;

- N*<sup>2</sup>-tert-Butyl-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;
- 5    *N*<sup>2</sup>-cyclohexyl-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;
- 10    5-{4-[(2-cyclohexylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl]-amino}-pyrimidin-2-ylamino}-2-methyl-benzenesulfonamide;
- 15    *N*<sup>2</sup>-cyclohexyl-*N*<sup>5</sup>-{2-[3-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;
- 20    *N*<sup>2</sup>-cyclohexyl-*N*<sup>5</sup>-{2-[4-(2-methanesulfonyl-ethyl)-phenylamino]-pyridin-4-yl}-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;
- 25    *N*<sup>2</sup>-cyclohexyl-*N*<sup>5</sup>-{2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;
- 30    2-methyl-5-{4-[methyl-(1-methyl-2-methylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;
- 35    (4-{4-[methyl-(1-methyl-2-methylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;
- 40    3-{4-[methyl-(1-methyl-2-methylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;
- 45    *N*<sup>5</sup>-[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>2</sup>, *N*<sup>5</sup>-trimethyl-1H-benzoimidazole-2,5-diamine; and
- 50    (4-{4-[(1-ethyl-2-methylamino-1H-benzoimidazol-5-yl)-methyl]-amino}-pyrimidin-2-ylamino)-phenyl)-methanesulfonamide;
- 55    or a salt, solvate, or physiologically functional derivative thereof.

Additional specific examples of compounds of the present invention include the following:

- 60    *N*<sup>1</sup>-methyl-*N*<sup>5</sup>-[2-(4-Methanesulfonmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>5</sup>-methyl-*N*<sup>2</sup>-(4-trifluoromethyl-phenyl)-1H-benzoimidazole-2,5-diamine;
- 65    *N*<sup>2</sup>-(3-chloro-phenyl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>1</sup>,*N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;
- 70    *N*<sup>2</sup>-(4-chloro-phenyl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>1</sup>,*N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2,4-dichloro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

5  $N^2$ -(2,5-dichloro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2-chloro-4-trifluoromethyl-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

10

$N^2$ -(2-chloro-5-trifluoromethyl-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-  $N^2$ -(4-morpholin-4-yl-phenyl)-1H-benzoimidazole-2,5-diamine;

15

$N^2$ -(3-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2,4-difluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

20

$N^2$ -(2-chloro-4-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

25

$N^2$ -(4-chloro-2-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2-chloro-5-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

30

$N^2$ -(2-fluoro-4-methyl-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

35

$N^2$ -(2-fluoro-5-trifluoromethyl-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-  $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

40

4-{4-[methyl-(1-methyl-2-methylsulfanyl-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzene sulfonamide;

4-{4-[(2-methanesulfinyl-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

45

4-(4-{methyl-[1-methyl-2-(4-trifluoromethyl-phenylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;



- (methyl-nitro-1H-benzimidazol-2-yl)-(3-trifluoromethyl-phenyl)-amine;
- (methyl-nitro-1H-benzimidazol-2-yl)-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester;
- (amino-methyl-1-benzimidazol-2-yl)-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester;
- [(2-chloro-pyrimidin-4-yl)-methyl-amino]-methyl-1H-benzimidazol-2-yl-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester; and
- N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>1</sup>, *N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(3-trifluoromethyl-phenyl)-1H-benzimidazole-2,5-diamine;
- or a salt, solvate, or physiologically functional derivative thereof.
- Further additional specific examples of compounds of the present invention include the following:
- N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-1H-methyl-amino-benzimidazole-2,5-diamine;
- N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1H-benzimidazole-2,5-diamine;
- N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1H-benzimidazole-2,5-diamine;
- N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-1H-benzimidazole-2,5-diamine;
- N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(3-methanesulfonyl-4-methyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1H-benzimidazole-2,5-diamine;
- 5-(4-{[2-(5-tert-butyl-isoxazol-3-ylamino)-1-methyl-1H-benzimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;
- N*<sup>2</sup>-(6-fluoro-4H-benzo[1,3]dioxin-8-ylmethyl)-*N*<sup>5</sup>-[2-(3-methanesulfonyl-4-methyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1H-benzimidazole-2,5-diamine; and
- N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-1-methyl-*N*<sup>5</sup>-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-1H-benzimidazole-2,5-diamine;
- or a salt, solvate, or physiologically functional derivative thereof.

Further additional specific examples of compounds of the present invention include the following:

- N*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)-*N'*-phenylurea;
- 5 *N*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)benzamide;
- N*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)indoline-1-carboxamide;
- 10 *N*-(5-tert-butylisoxazol-3-yl)-*N'*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)urea;
- N*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)-2-phenylacetamide;
- 15 *N*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)-1-phenylcyclopropanecarboxamide;
- N*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)isonicotinamide;
- 20 *N*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)cyclohexanecarboxamide;
- 25 2-(benzyloxy)-*N*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)acetamide;
- 2-(3-methylisoxazol-5-yl)-*N*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)acetamide; and
- 30 3-[(dimethylamino)methyl]-*N*-(1-methyl-5-{methyl[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)benzamide;
- or a salt, solvate, or physiologically functional derivative thereof.
- 35
- Further additional specific examples of compounds of the present invention include the following:
- N*-({[3-(4-methanesulfonylmethyl-phenylamino)-phenyl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-C-thiophen-2-yl-acetamide;
- 40 C-fluoro-*N*-({[3-(3-methanesulfonylmethyl-phenylamino)-phenyl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-trifluoromethyl-benzamide;
- difluoro-*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-benzamide;
- 45

- N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-3,5-bis-trifluoromethyl-benzamide;
- 5 cyclohexanecarboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-methyl-benzamide;
- 10 *N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-4-methoxy-benzamide;
- C-(chloro-trifluoromethyl-phenyl)-*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 15 (3,5-bis-trifluoromethyl-phenyl)-*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- N*-(5-{[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-2-(3-trifluoromethylsulfanyl-phenyl)-acetamide;
- 20 (2,4-bis-trifluoromethyl-phenyl)-*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 25 (2-fluoro-5-trifluoromethyl-phenyl)-*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 3H-benzotriazole-5-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- 30 3H-benzoimidazole-5-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- thiophene-2-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- 35 thiophene-3-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- 40 *N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-C-thiophen-2-yl-acetamide;

- 3-methyl-thiophene-2-carboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- 5 furan-3-carboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- 3-methyl-furan-2-carboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- 10 *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-2-(3-methyl-isoxazol-5-yl)-acetamide;
- C-(chloro-trifluoromethyl-phenyl)-*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 15 *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-2-(3-trifluoromethylsulfonyl-phenyl)-acetamide;
- C-(fluoro-trifluoromethyl-phenyl)-*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-dimethyl-butyramide;
- 25 2-propyl-pentanoic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-isobutyramide;
- 30 cyclopropanecarboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-4-methoxy-benzamide;
- 35 4-methoxy-*N*-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-benzamide;
- 40

furan-2-carboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

5 *N*-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-C-thiophen-2-yl-acetamide;

C-(chloro-trifluoromethyl-phenyl)-*N*-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-acetamide;

10 4-methoxy-*N*-[methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-benzamide;

15 *N*-[methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-C-thiophen-2-yl-acetamide;

thiophene-2-carboxylic acid [methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide;

20 furan-2-carboxylic acid [methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide;

*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-2-(3-methyl-isoxazol-5-yl)-acetamide;

25 furan-2-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

30 2-(3-methyl-isoxazol-5-yl)-*N*-[methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-acetamide;

3-methyl-furan-2-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

35 *N*-[methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-C-thiophen-2-yl-acetamide;

thiophene-2-carboxylic acid [methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide;

40 furan-2-carboxylic acid [methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide;

2-(3-methyl-isoxazol-5-yl)-*N*-[methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-acetamide;

5 *N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-dimethyl-butylamide;

*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-propionamide;

10 pentanoic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

15 *N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-butylamide;

phenyl- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

20 phenylcyclopropanecarboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

25 1-(2,5-difluoro-phenyl)-cyclopropanecarboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

1-(4-chloro-phenyl)-cyclopropanecarboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

30 2-(4-fluoro-phenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

35 (3,5-bistrifluoromethyl-phenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

(3,4-dichlorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

40 1-(2,5-difluorophenyl)-cyclopropanecarboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

- (2,5-difluorophenyl)- *N* -({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 5 (3,4-dichlorophenyl)- *N* -({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H -benzoimidazol-2-yl)-acetamide;
- 10 1-(2,5-difluorophenyl)-cyclopropanecarboxylic acid ({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H -benzoimidazol-2-yl)-amide;
- 15 1-(3,4-dichlorophenyl)-cyclopropanecarboxylic acid ({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H -benzoimidazol-2-yl)-amide;
- 20 3,4-dichlorophenyl- *N* -({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 25 1-(2,5-difluorophenyl)-cyclopropanecarboxylic acid (methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H -benzoimidazol-2-yl)-amide;
- 1-(3,4-dichlorophenyl)-cyclopropanecarboxylic acid (methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H -benzoimidazol-2-yl)-amide;
- 30 (3,4-dichlorophenyl)- *N* -(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H -benzoimidazol-2-yl)-acetamide;
- 2-(2,3-dimethoxyphenyl)- *N* -(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 35 2-(2-methoxyphenyl)-*N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 2-(3-methoxyphenyl)-*N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 40 2-(3-methoxyphenyl)-*N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 2-(2-fluorophenyl)- *N* -({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

- 2-(3-fluorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 5 (2,5-difluorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- (2,3-difluorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 10 2-(3,4-dimethoxyphenyl)- *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;
- (2,5-difluorophenyl)- *N*-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-acetamide;
- 15 1-(3,4-dichloro-phenyl)-cyclopropanecarboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;
- 20 2-(2-chlorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 2-(3-chlorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 25 2-(4-chlorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 2-(3,5-dimethoxyphenyl)- *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 30 2-(2,5-dimethoxyphenyl)- *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;
- 35 (2,5-dichlorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;
- N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-methyl-C-phenyl-butyramide;
- 40 (3,5-dimethylphenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;



*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-phenyl-isobutyramide; and

5 benzo[1,3]dioxol-5-yl-*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

or a salt, solvate, or physiologically functional derivative thereof.

Typically, the salts of the present invention are pharmaceutically acceptable  
 10 salts. Salts encompassed within the term "pharmaceutically acceptable salts" refer to non-toxic salts of the compounds of this invention. Salts of the compounds of the present invention may comprise acid addition salts derived from a nitrogen on a substituent in the compound of formula (I). Representative salts include the following salts: acetate, benzenesulfonate, benzoate, bicarbonate, bisulfate, bitartrate, borate,  
 15 bromide, calcium edetate, camsylate, carbonate, chloride, clavulanate, citrate, dihydrochloride, edetate, edisylate, estolate, esylate, fumarate, gluceptate, gluconate, glutamate, glycolylarsanilate, hexylresorcinate, hydrabamine, hydrobromide, hydrochloride, hydroxynaphthoate, iodide, isethionate, lactate, lactobionate, laurate, malate, maleate, mandelate, mesylate, methylbromide, methylnitrate, methylsulfate,  
 20 monopotassium maleate, mucate, napsylate, nitrate, *N*-methylglucamine, oxalate, pamoate (embonate), palmitate, pantothenate, phosphate/diphosphate, polygalacturonate, potassium, salicylate, sodium, stearate, subacetate, succinate, tannate, tartrate, teoclate, tosylate, triethiodide, trimethylammonium and valerate. Other salts, which are not pharmaceutically acceptable, may be useful in the  
 25 preparation of compounds of this invention and these form a further aspect of the invention.

While it is possible that, for use in therapy, therapeutically effective amounts of a compound of formula (I), as well as salts, solvates and physiological functional  
 30 derivatives thereof, may be administered as the raw chemical, it is possible to present the active ingredient as a pharmaceutical composition. Accordingly, the invention further provides pharmaceutical compositions, which include therapeutically effective amounts of compounds of the formula (I) and salts, solvates and physiological functional derivatives thereof, and one or more pharmaceutically acceptable carriers,

diluents, or excipients. The compounds of the formula (I) and salts, solvates and physiological functional derivatives thereof, are as described above. The carrier(s), diluent(s) or excipient(s) must be acceptable in the sense of being compatible with the other ingredients of the formulation and not deleterious to the recipient thereof. In accordance with another aspect of the invention there is also provided a process for the preparation of a pharmaceutical formulation including admixing a compound of the formula (I), or salts, solvates and physiological functional derivatives thereof, with one or more pharmaceutically acceptable carriers, diluents or excipients.

Pharmaceutical formulations may be presented in unit dose forms containing a predetermined amount of active ingredient per unit dose. Such a unit may contain, for example, 0.5mg to 1g, preferably 1mg to 700mg, more preferably 5mg to 100mg of a compound of the formula (I), depending on the condition being treated, the route of administration and the age, weight and condition of the patient, or pharmaceutical formulations may be presented in unit dose forms containing a predetermined amount of active ingredient per unit dose. Preferred unit dosage formulations are those containing a daily dose or sub-dose, as herein above recited, or an appropriate fraction thereof, of an active ingredient. Furthermore, such pharmaceutical formulations may be prepared by any of the methods well known in the pharmacy art.

Pharmaceutical formulations may be adapted for administration by any appropriate route, for example by the oral (including buccal or sublingual), rectal, nasal, topical (including buccal, sublingual or transdermal), vaginal or parenteral (including subcutaneous, intramuscular, intravenous or intradermal) route. Such formulations may be prepared by any method known in the art of pharmacy, for example by bringing into association the active ingredient with the carrier(s) or excipient(s).

Pharmaceutical formulations adapted for oral administration may be presented as discrete units such as capsules or tablets; powders or granules; solutions or suspensions in aqueous or non-aqueous liquids; edible foams or whips; or oil-in-water liquid emulsions or water-in-oil liquid emulsions.

For instance, for oral administration in the form of a tablet or capsule, the active drug component can be combined with an oral, non-toxic pharmaceutically acceptable inert carrier such as ethanol, glycerol, water and the like. Powders are prepared by comminuting the compound to a suitable fine size and mixing with a similarly comminuted pharmaceutical carrier such as an edible carbohydrate, as, for example, starch or mannitol. Flavoring, preservative, dispersing and coloring agent can also be present.

Capsules are made by preparing a powder mixture, as described above, and filling formed gelatin sheaths. Glidants and lubricants such as colloidal silica, talc, magnesium stearate, calcium stearate or solid polyethylene glycol can be added to the powder mixture before the filling operation. A disintegrating or solubilizing agent such as agar-agar, calcium carbonate or sodium carbonate can also be added to improve the availability of the medicament when the capsule is ingested.

Moreover, when desired or necessary, suitable binders, lubricants, disintegrating agents and coloring agents can also be incorporated into the mixture. Suitable binders include starch, gelatin, natural sugars such as glucose or beta-lactose, corn sweeteners, natural and synthetic gums such as acacia, tragacanth or sodium alginate, carboxymethylcellulose, polyethylene glycol, waxes and the like. Lubricants used in these dosage forms include sodium oleate, sodium stearate, magnesium stearate, sodium benzoate, sodium acetate, sodium chloride and the like. Disintegrators include, without limitation, starch, methyl cellulose, agar, bentonite, xanthan gum and the like. Tablets are formulated, for example, by preparing a powder mixture, granulating or slugging, adding a lubricant and disintegrant and pressing into tablets. A powder mixture is prepared by mixing the compound, suitably comminuted, with a diluent or base as described above, and optionally, with a binder such as carboxymethylcellulose, an aliginate, gelatin, or polyvinyl pyrrolidone, a solution retardant such as paraffin, a resorption accelerator such as a quaternary salt and/or an absorption agent such as bentonite, kaolin or dicalcium phosphate. The powder mixture can be granulated by wetting with a binder such as syrup, starch paste, acadia

mucilage or solutions of cellulosic or polymeric materials and forcing through a screen. As an alternative to granulating, the powder mixture can be run through the tablet machine and the result is imperfectly formed slugs broken into granules. The granules can be lubricated to prevent sticking to the tablet forming dies by means of the addition of stearic acid, a stearate salt, talc or mineral oil. The lubricated mixture is then compressed into tablets. The compounds of the present invention can also be combined with a free flowing inert carrier and compressed into tablets directly without going through the granulating or slugging steps. A clear or opaque protective coating consisting of a sealing coat of shellac, a coating of sugar or polymeric material and a polish coating of wax can be provided. Dyestuffs can be added to these coatings to distinguish different unit dosages.

Oral fluids such as solution, syrups and elixirs can be prepared in dosage unit form so that a given quantity contains a predetermined amount of the compound. Syrups can be prepared by dissolving the compound in a suitably flavored aqueous solution, while elixirs are prepared through the use of a non-toxic alcoholic vehicle. Suspensions can be formulated by dispersing the compound in a non-toxic vehicle. Solubilizers and emulsifiers such as ethoxylated isostearyl alcohols and polyoxy ethylene sorbitol ethers, preservatives, flavor additive such as peppermint oil or natural sweeteners or saccharin or other artificial sweeteners, and the like can also be added.

Where appropriate, dosage unit formulations for oral administration can be microencapsulated. The formulation can also be prepared to prolong or sustain the release as for example by coating or embedding particulate material in polymers, wax or the like.

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The compounds of formula (I), and salts, solvates and physiological functional derivatives thereof, can also be administered in the form of liposome delivery systems, such as small unilamellar vesicles, large unilamellar vesicles and multilamellar vesicles. Liposomes can be formed from a variety of phospholipids, such as cholesterol, stearylamine or phosphatidylcholines.

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The compounds of formula (I) and salts, solvates and physiological functional derivatives thereof may also be delivered by the use of monoclonal antibodies as individual carriers to which the compound molecules are coupled. The compounds may also be coupled with soluble polymers as targetable drug carriers. Such polymers can include polyvinylpyrrolidone, pyran copolymer, polyhydroxypropylmethacrylamide-phenol, polyhydroxyethylaspartamidophenol, or polyethyleneoxidepolylysine substituted with palmitoyl residues. Furthermore, the compounds may be coupled to a class of biodegradable polymers useful in achieving controlled release of a drug, for example, polylactic acid, polyepsilon caprolactone, polyhydroxy butyric acid, polyorthoesters, polyacetals, polydihydropyrans, polycyanoacrylates and cross-linked or amphipathic block copolymers of hydrogels.

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Pharmaceutical formulations adapted for transdermal administration may be presented as discrete patches intended to remain in intimate contact with the epidermis of the recipient for a prolonged period of time. For example, the active ingredient may be delivered from the patch by iontophoresis as generally described in Pharmaceutical Research, 3(6), 318 (1986).

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Pharmaceutical formulations adapted for topical administration may be formulated as ointments, creams, suspensions, lotions, powders, solutions, pastes, gels, sprays, aerosols or oils.

For treatments of the eye or other external tissues, for example mouth and skin, the formulations are preferably applied as a topical ointment or cream. When formulated in an ointment, the active ingredient may be employed with either a paraffinic or a water-miscible ointment base. Alternatively, the active ingredient may be formulated in a cream with an oil-in-water cream base or a water-in-oil base.

Pharmaceutical formulations adapted for topical administrations to the eye include eye drops wherein the active ingredient is dissolved or suspended in a suitable carrier, especially an aqueous solvent.

Pharmaceutical formulations adapted for topical administration in the mouth include lozenges, pastilles and mouth washes.

Pharmaceutical formulations adapted for rectal administration may be presented as suppositories or as enemas.

Pharmaceutical formulations adapted for nasal administration wherein the carrier is a solid include a coarse powder having a particle size for example in the range 20 to 500 microns which is administered in the manner in which snuff is taken, i.e. by rapid inhalation through the nasal passage from a container of the powder held close up to the nose. Suitable formulations wherein the carrier is a liquid, for administration as a nasal spray or as nasal drops, include aqueous or oil solutions of the active ingredient.

Pharmaceutical formulations adapted for administration by inhalation include fine particle dusts or mists, which may be generated by means of various types of metered, dose pressurised aerosols, nebulizers or insufflators.

Pharmaceutical formulations adapted for vaginal administration may be presented as pessaries, tampons, creams, gels, pastes, foams or spray formulations.

Pharmaceutical formulations adapted for parenteral administration include aqueous and non-aqueous sterile injection solutions which may contain anti-oxidants, buffers, bacteriostats and solutes which render the formulation isotonic with the blood of the intended recipient; and aqueous and non-aqueous sterile suspensions  
5 which may include suspending agents and thickening agents. The formulations may be presented in unit-dose or multi-dose containers, for example sealed ampoules and vials, and may be stored in a freeze-dried (lyophilized) condition requiring only the addition of the sterile liquid carrier, for example water for injections, immediately prior to use. Extemporaneous injection solutions and suspensions may be prepared  
10 from sterile powders, granules and tablets.

It should be understood that in addition to the ingredients particularly mentioned above, the formulations may include other agents conventional in the art having regard to the type of formulation in question, for example those suitable for  
15 oral administration may include flavouring agents.

A therapeutically effective amount of a compound of the present invention will depend upon a number of factors including, for example, the age and weight of the animal, the precise condition requiring treatment and its severity, the nature of  
20 the formulation, and the route of administration, and will ultimately be at the discretion of the attendant physician or veterinarian. However, an effective amount of a compound of formula (I) for the treatment of neoplastic growth, for example colon or breast carcinoma, will generally be in the range of 0.1 to 100 mg/kg body weight of recipient (mammal) per day and more usually in the range of 1 to 10 mg/kg  
25 body weight per day. Thus, for a 70kg adult mammal, the actual amount per day would usually be from 70 to 700 mg and this amount may be given in a single dose per day or more usually in a number (such as two, three, four, five or six) of sub-doses per day such that the total daily dose is the same. An effective amount of a salt or solvate, or physiologically functional derivative thereof, may be determined as a  
30 proportion of the effective amount of the compound of formula (I) *per se*. It is envisaged that similar dosages would be appropriate for treatment of the other conditions referred to above.

The compounds of the present invention and their salts and solvates, and physiologically functional derivatives thereof, may be employed alone or in combination with other therapeutic agents for the treatment of the above-mentioned conditions. In particular, in anti-cancer therapy, combination with other chemotherapeutic, hormonal or antibody agents is envisaged as well as combination with surgical therapy and radiotherapy. Combination therapies according to the present invention thus comprise the administration of at least one compound of formula (I) or a pharmaceutically acceptable salt or solvate thereof, or a physiologically functional derivative thereof, and the use of at least one other cancer treatment method. Preferably, combination therapies according to the present invention comprise the administration of at least one compound of formula (I) or a pharmaceutically acceptable salt or solvate thereof, or a physiologically functional derivative thereof, and at least one other pharmaceutically active agent, preferably an anti-neoplastic agent. The compound(s) of formula (I) and the other pharmaceutically active agent(s) may be administered together or separately and, when administered separately this may occur simultaneously or sequentially in any order. The amounts of the compound(s) of formula (I) and the other pharmaceutically active agent(s) and the relative timings of administration will be selected in order to achieve the desired combined therapeutic effect.

The compounds of the Formula (I) or salts, solvates, or physiologically functional derivatives thereof and at least one additional cancer treatment therapy may be employed in combination concomitantly or sequentially in any therapeutically appropriate combination with such other anti-cancer therapies. In one embodiment, the other anti-cancer therapy is at least one additional chemotherapeutic therapy including administration of at least one anti-neoplastic agent. The administration in combination of a compound of formula (I) or salts, solvates, or physiologically functional derivatives thereof with other anti-neoplastic agents may be in combination in accordance with the invention by administration concomitantly in (1) a unitary pharmaceutical composition including both compounds or (2) separate pharmaceutical compositions each including one of the compounds. Alternatively, the



combination may be administered separately in a sequential manner wherein one anti-neoplastic agent is administered first and the other second or vice versa. Such sequential administration may be close in time or remote in time.

5           Anti-neoplastic agents may induce anti-neoplastic effects in a cell-cycle specific manner, i.e., are phase specific and act at a specific phase of the cell cycle, or bind DNA and act in a non cell-cycle specific manner, i.e., are non-cell cycle specific and operate by other mechanisms.

10           Anti-neoplastic agents useful in combination with the compounds and salts, solvates or physiologically functional derivatives thereof of formula I include the following:

(1) cell cycle specific anti-neoplastic agents including, but not limited to,  
15       diterpenoids such as paclitaxel and its analog docetaxel; vinca alkaloids such as vinblastine, vincristine, vindesine, and vinorelbine; epipodophyllotoxins such as etoposide and teniposide; gemcitabine; fluoropyrimidines such as 5-fluorouracil and fluorodeoxyuridine ; antimetabolites such as allopurinol, fludurabine, methotrexate, cladribine, cytarabine, mercaptopurine and thioguanine; and camptothecins such as  
20       9-amino camptothecin, irinotecan, topotecan, CPT-11 and the various optical forms of 7-(4-methylpiperazino-methylene)-10,11-ethylenedioxy-20-camptothecin;

(2) cytotoxic chemotherapeutic agents including, but not limited to, alkylating agents such as melphalan, chlorambucil, cyclophosphamide, mechlorethamine,  
25       hexamethylmelamine, busulfan, carmustine, lomustine, and dacarbazine; anti-tumour antibiotics such as doxorubicin, daunomycin, epirubicin, idarubicin, mitomycin-C, dactinomycin and mithramycin; and platinum coordination complexes such as cisplatin, carboplatin, and oxaliplatin; and

30           (3) other chemotherapeutic agents including, but not limited to, anti-estrogens such as tamoxifen, toremifene, raloxifene, droloxifene and iodoxyfene; progestrogens such as megestrol acetate; aromatase inhibitors such as anastrozole, letrozole,

vorazole, and exemestane; antiandrogens such as flutamide, nilutamide, bicalutamide, and cyproterone acetate; LHRH agonists and antagonists such as goserelin acetate and luprolide, testosterone 5 $\alpha$ -dihydroreductase inhibitors such as finasteride; metalloproteinase inhibitors such as marimastat; antiprogestogens; urokinase plasminogen activator receptor function inhibitors; growth factor function inhibitors such as inhibitors of the functions of hepatocyte growth factor; erb-B2, erb-B4, epidermal growth factor receptor (EGFR), platelet derived growth factor receptor (PDGFR), vascular endothelial growth factor receptor (VEGFR, and TIE-2 (other than those VEGFR and TIE-2 inhibitors described in the present invention); and other tyrosine kinase inhibitors such as inhibitors of CDK2 and CDK4 inhibitors.

The compounds of formula (I) and salts, solvates and physiological functional derivatives thereof, are believed to have anticancer activity as a result of inhibition of the protein kinase TIE-2 and/or VEGFR-2 and its effect on selected cell lines whose growth is dependent on TIE-2 and/or VEGFR-2 protein kinase activity.

The present invention thus also provides compounds of formula (I) and pharmaceutically acceptable salts or solvates thereof, or physiologically functional derivatives thereof, for use in medical therapy, and particularly in the treatment of disorders mediated by at least one of inappropriate TIE-2 and VEGFR-2 activity.

The inappropriate TIE-2 and/or VEGFR-2 activity referred to herein is any TIE-2 and/or VEGFR-2 activity that deviates from the normal TIE-2 and/or VEGFR-2 activity expected in a particular mammalian subject. Inappropriate TIE-2 and/or VEGFR-2 activity may take the form of, for instance, an abnormal increase in activity, or an aberration in the timing and or control of TIE-2 and/or VEGFR-2 activity. Such inappropriate activity may result then, for example, from overexpression or mutation of the protein kinase leading to inappropriate or uncontrolled activation. Furthermore, it is also understood that unwanted TIE-2 and/or VEGFR-2 activity may reside in an abnormal source, such as a malignancy. That is, the level of TIE-2 and/or VEGFR-2 activity does not have to be abnormal to be considered inappropriate, rather the activity derives from an abnormal source. In a like manner, the inappropriate

angiogenesis referred to herein is any angiogenic activity that deviates from the normal angiogenic activity expected in a particular mammalian subject. Inappropriate angiogenesis may take the form of, for instance, an abnormal increase in activity, or an aberration in the timing and or control of angiogenic activity. Such inappropriate activity may result then, for example, from overexpression or mutation of a protein kinase leading to inappropriate or uncontrolled activation. Furthermore, it is also understood that unwanted angiogenic activity may reside in an abnormal source, such as a malignancy. That is, the level of angiogenic activity does not have to be abnormal to be considered inappropriate, rather the activity derives from an abnormal source.

10

The present invention is directed to methods of regulating, modulating, or inhibiting TIE-2 and/or VEGFR-2 for the prevention and/or treatment of disorders related to unregulated TIE-2 and/or VEGFR-2 activity. In particular, the compounds of the present invention can also be used in the treatment of certain forms of cancer. Furthermore, the compounds of the present invention can be used to provide additive or synergistic effects with certain existing cancer chemotherapies, and/or be used to restore effectiveness of certain existing cancer chemotherapies and radiation.

15

The compounds of the present invention are also useful in the treatment of one or more diseases afflicting mammals which are characterized by cellular proliferation in the area of disorders associated with neo-vascularization and/or vascular permeability including blood vessel proliferative disorders including arthritis and restenosis; fibrotic disorders including hepatic cirrhosis and atherosclerosis; mesangial cell proliferative disorders include glomerulonephritis, diabetic nephropathy, malignant nephrosclerosis, thrombotic microangiopathy syndromes, organ transplant rejection and glomerulopathies; and metabolic disorders include psoriasis, diabetes mellitus, chronic wound healing, inflammation and neurodegenerative diseases.

20

25

A further aspect of the invention provides a method of treatment of a mammal suffering from a disorder mediated by at least one of inappropriate TIE-2 and VEGFR-2 activity, including susceptible malignancies, which includes administering to said subject an effective amount of a compound of formula (I) or a pharmaceutically

30

acceptable salt, solvate, or a physiologically functional derivative thereof. In a preferred embodiment, the disorder is a susceptible cancer.

5 A further aspect of the invention provides a method of treatment of a mammal suffering from cancer which includes administering to said subject an effective amount of a compound of formula (I) or a pharmaceutically acceptable salt or solvate thereof, or a physiologically functional derivative thereof.

10 A further aspect of the present invention provides the use of a compound of formula (I), or a pharmaceutically acceptable salt or solvate thereof, or a physiologically functional derivative thereof, in the preparation of a medicament for the treatment of a disorder characterized by at least one of inappropriate TIE-2 and VEGFR-2 activity. In a preferred embodiment, the disorder is a susceptible cancer.

15 A further aspect of the present invention provides the use of a compound of formula (I), or a pharmaceutically acceptable salt or solvate thereof, or a physiologically functional derivative thereof, in the preparation of a medicament for the treatment of cancer and malignant tumors.

20 The mammal requiring treatment with a compound of the present invention is typically a human being.

25 In another embodiment, therapeutically effective amounts of the compounds of formula (I) or salts, solvates or physiologically derived derivatives thereof and agents which inhibit growth factor receptor function may be administered in combination to a mammal for treatment of a disorder mediated by at least one of inappropriate TIE-2 and VEGFR-2 activity, for instance in the treatment of cancer. Such growth factor receptors include, for example, EGFR, PDGFR, erbB2, erbB4, VEGFR, and/or TIE-2. Growth factor receptors and agents that inhibit growth factor receptor  
30 function are described, for instance, in Kath, John C., Exp. Opin. Ther. Patents (2000) 10(6):803-818 and in Shawver et al DDT Vol 2, No. 2 February 1997.

The compounds of the formula (I) or salts, solvates, or physiologically functional derivatives thereof and the agent for inhibiting growth factor receptor function may be employed in combination concomitantly or sequentially in any therapeutically appropriate combination. The combination may be employed in combination in accordance with the invention by administration concomitantly in (1) a unitary pharmaceutical composition including both compounds or (2) separate pharmaceutical compositions each including one of the compounds. Alternatively, the combination may be administered separately in a sequential manner wherein one is administered first and the other second or vice versa. Such sequential administration may be close in time or remote in time.

In another aspect of the present invention, there is provided a method of treating a disorder in a mammal, said disorder being mediated by inappropriate angiogenesis, including: administering to said mammal a therapeutically effective amount of a compound of formula (I), or a salt, solvate or physiologically functional derivative thereof. In one embodiment, the inappropriate angiogenic activity is due to at least one of inappropriate VEGFR1, VEGFR2, VEGFR3, or TIE-2 activity. In another embodiment, the inappropriate angiogenesis is due to inappropriate VEGFR2 and TIE-2 activity. In a further embodiment, the method further includes administering a therapeutically effective amount of a VEGFR2 inhibitor along with the compounds of formula (I) or salts, solvates or physiologically functional derivatives thereof. Preferably the disorder is a susceptible cancer.

In another aspect of the present invention, there is provided the use of a compound of formula (I), or a salt, solvate or physiologically functional derivative thereof in the preparation of a medicament for use in treating a disorder in a mammal, said disorder being characterized by inappropriate angiogenesis. In one embodiment, the inappropriate angiogenic activity is due to at least one of inappropriate VEGFR1, VEGFR2, VEGFR3 or TIE-2 activity. In another embodiment, the inappropriate angiogenesis is due to inappropriate VEGFR2 and TIE-2 activity. In a further embodiment, the use further includes use of a VEGFR2 inhibitor to prepare said medicament.

The combination of a compound of formula (I) or salts, solvates, or physiologically functional derivatives thereof with a VEGFR2 inhibitor may be employed in combination in accordance with the invention by administration  
5 concomitantly in (1) a unitary pharmaceutical composition including both compounds or (2) separate pharmaceutical compositions each including one of the compounds. Alternatively, the combination may be administered separately in a sequential manner wherein one is administered first and the other second or vice versa. Such sequential administration may be close in time or remote in time.

10

The compounds of this invention may be made by a variety of methods, including standard chemistry. Any previously defined variable will continue to have the previously defined meaning unless otherwise indicated. Illustrative general synthetic methods are set out below and then specific compounds of the invention are  
15 prepared in the Working Examples.

20

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Compounds of general formula (I) may be prepared by methods known in the art of organic synthesis as set forth in part by the following synthesis schemes. In all of the schemes described below, it is well understood that protecting groups for sensitive or reactive groups are employed where necessary in accordance with general principles of chemistry. Protecting groups are manipulated according to standard methods of organic synthesis (T. W. Green and P. G. M. Wuts (1991) Protecting Groups in Organic Synthesis, John Wiley & Sons). These groups are removed at a convenient stage of the compound synthesis using methods that are readily apparent to those skilled in the art. The selection of processes as well as the reaction conditions and order of their execution shall be consistent with the preparation of compounds of Formula (I). Those skilled in the art will recognize if a stereocenter exists in compounds of Formula (I). Accordingly, the present invention includes both possible stereoisomers and includes not only racemic compounds but the individual enantiomers as well. When a compound is desired as a single enantiomer, it may be obtained by stereospecific synthesis or by resolution of the final product or any convenient intermediate. Resolution of the final product, an intermediate, or a

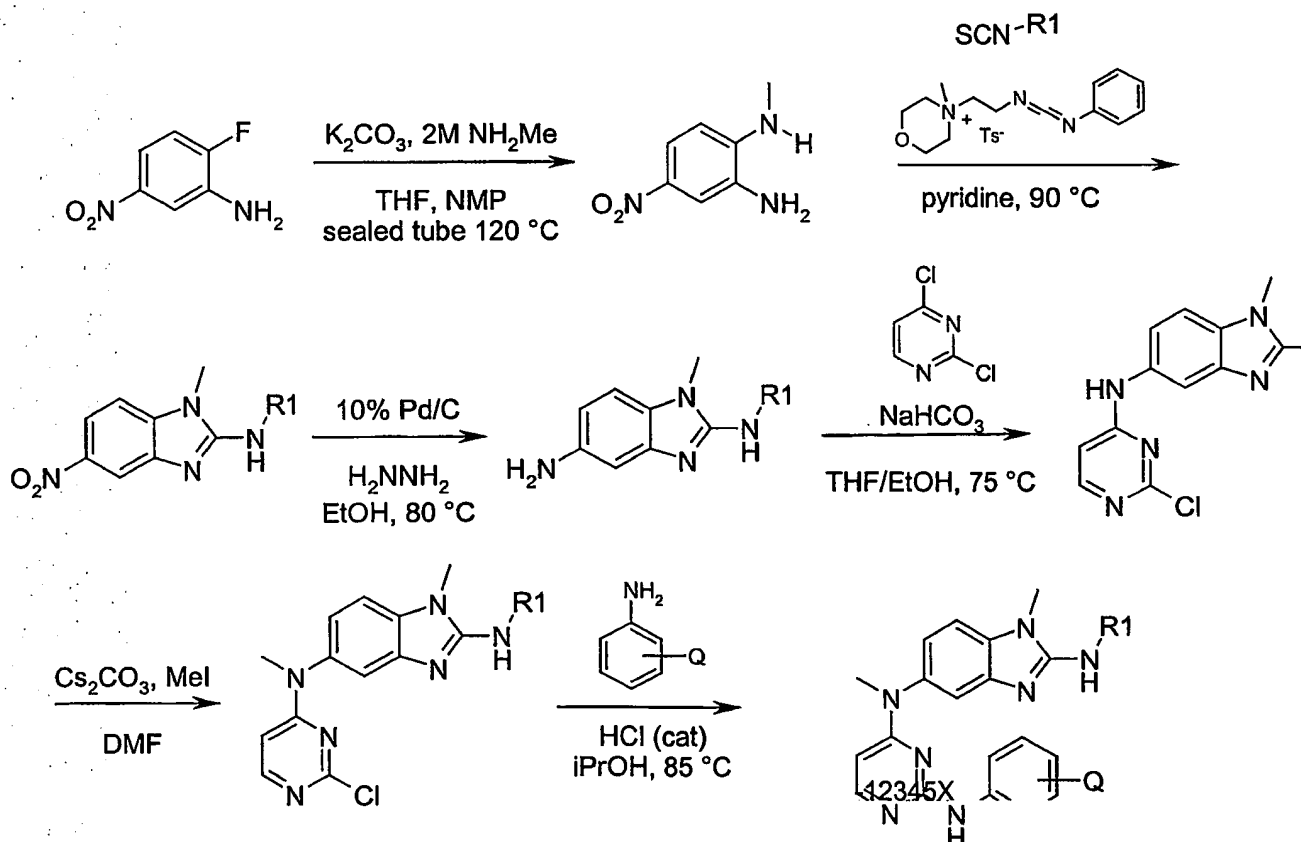
starting material may be effected by any suitable method known in the art. See, for example, Stereochemistry of Organic Compounds by E. L. Eliel, S. H. Wilen, and L. N. Mander (Wiley-Interscience, 1994).

- 5 Compounds of Formula I can be prepared according to the synthetic sequences illustrated in Schemes 1, 2, 3, 4, and 5 and further detailed in the Examples section following.

- 10 Scheme 1 illustrates the synthetic scheme for the preparation of N-alkyl and N-benzyl 2-aminobenzimidazole derivatives of Formula I. That is, those compounds of formula I wherein D is  $-NRR^1$ . In this scheme R is hydrogen,  $R^1$  is as defined above, and Q represents 1 or more substituents as defined by  $Q_1$ ,  $Q_2$ , and  $Q_3$  above.

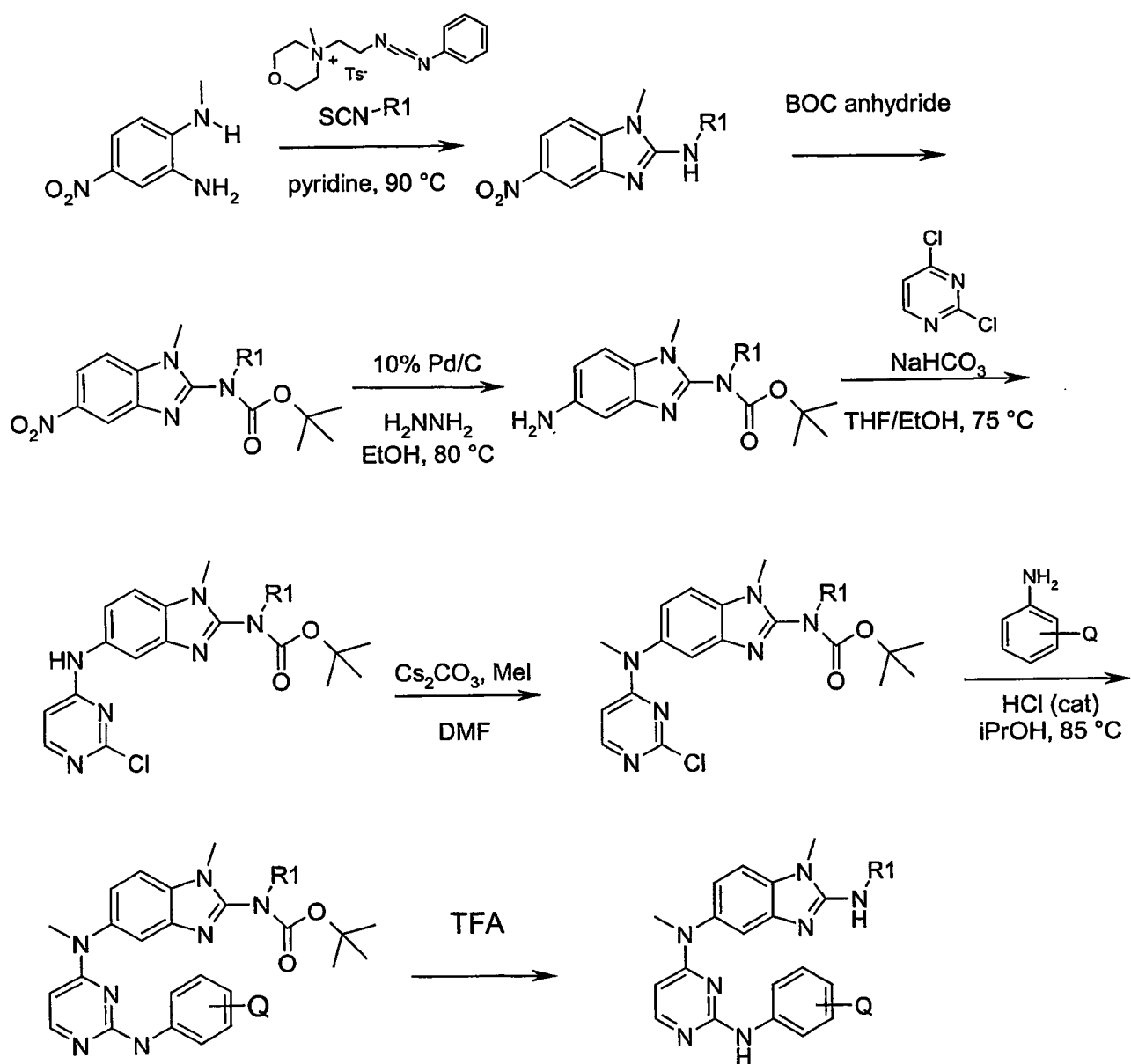
*Scheme 1*

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Scheme 2 illustrates the synthetic scheme for the preparation of N-aryl-2-aminobenzimidazole derivatives of Formula I. That is, those compounds of formula I wherein D is -NRR<sup>1</sup>. In this scheme R is hydrogen, R<sup>1</sup> is aryl or aryalkyl, and Q represents 1 or more substituents as defined by Q<sub>1</sub>, Q<sub>2</sub>, and Q<sub>3</sub> above.

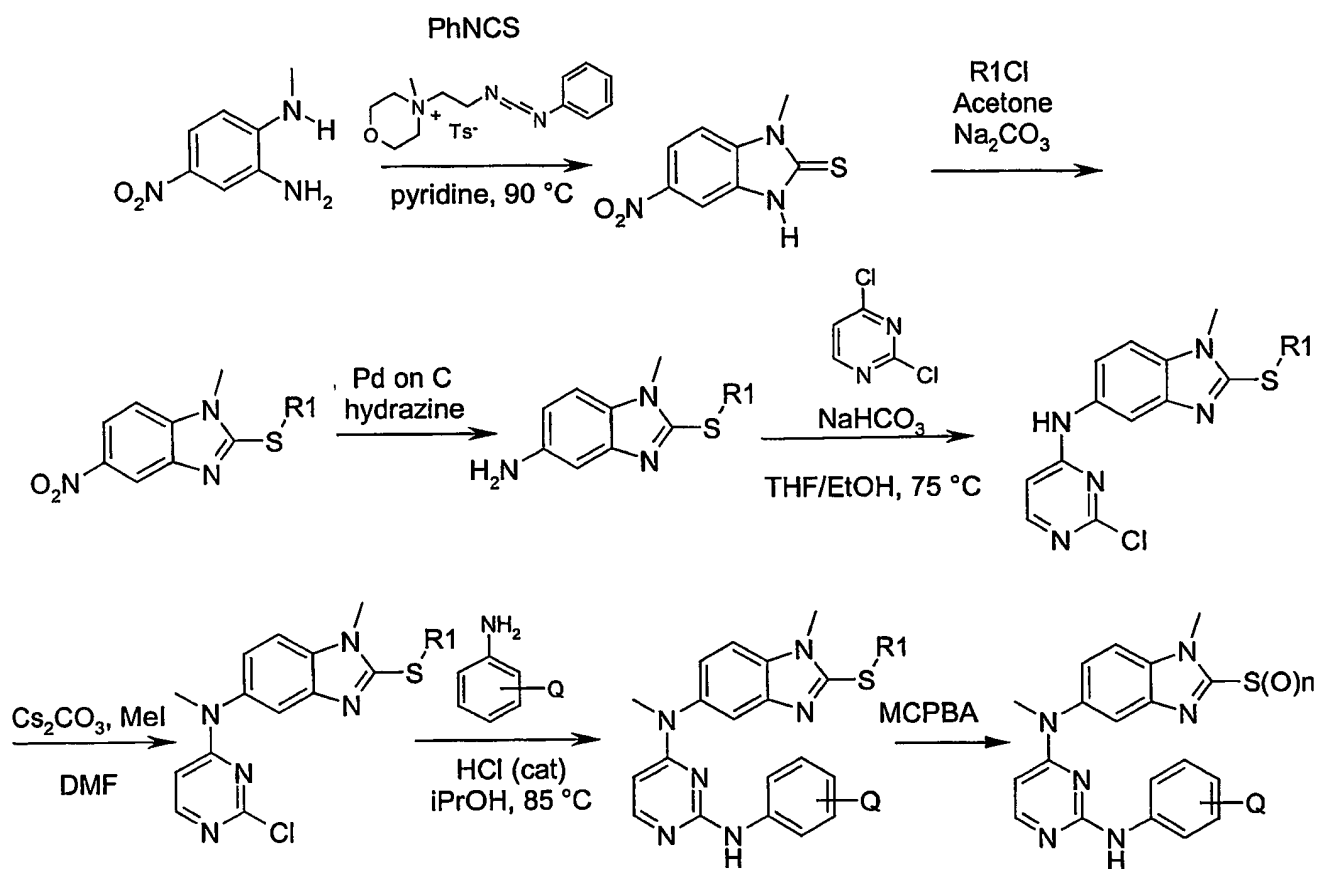
*Scheme 2*





Scheme 3 illustrates the synthetic scheme for the preparation of alkylthiobenzimidazole derivatives of Formula I. That is, those compounds of formula I wherein D is  $-SR^1$ ,  $-S(O)R^1$ , or  $-S(O)_2R^1$ . In this scheme  $R^1$  is as defined above, n is 1 or 2, and Q represents 1 or more substituents as defined by  $Q_1$ ,  $Q_2$ , and  $Q_3$  above.

*Scheme 3*



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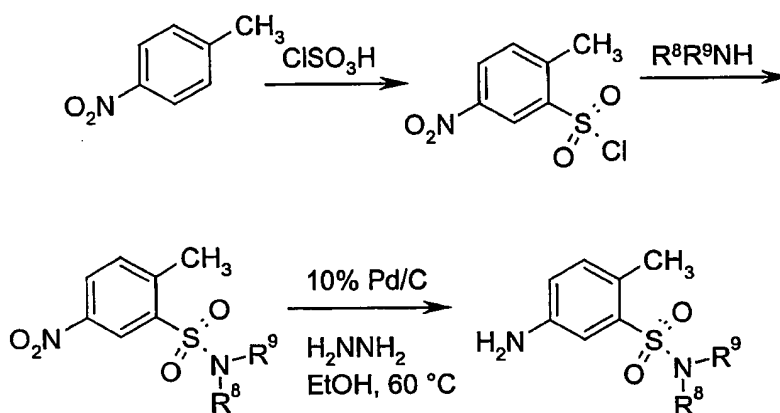
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Scheme 4 illustrates the synthetic scheme for the preparation of tailpieces of the aminobenzimidazole derivatives of Formula I. That is, those compounds of formula I wherein Q represents 1 or more substituents as defined by Q<sub>1</sub>, Q<sub>2</sub>, Q<sub>3</sub> above. Also, R<sup>8</sup> and R<sup>9</sup> are as defined above.

5

*Scheme 4*

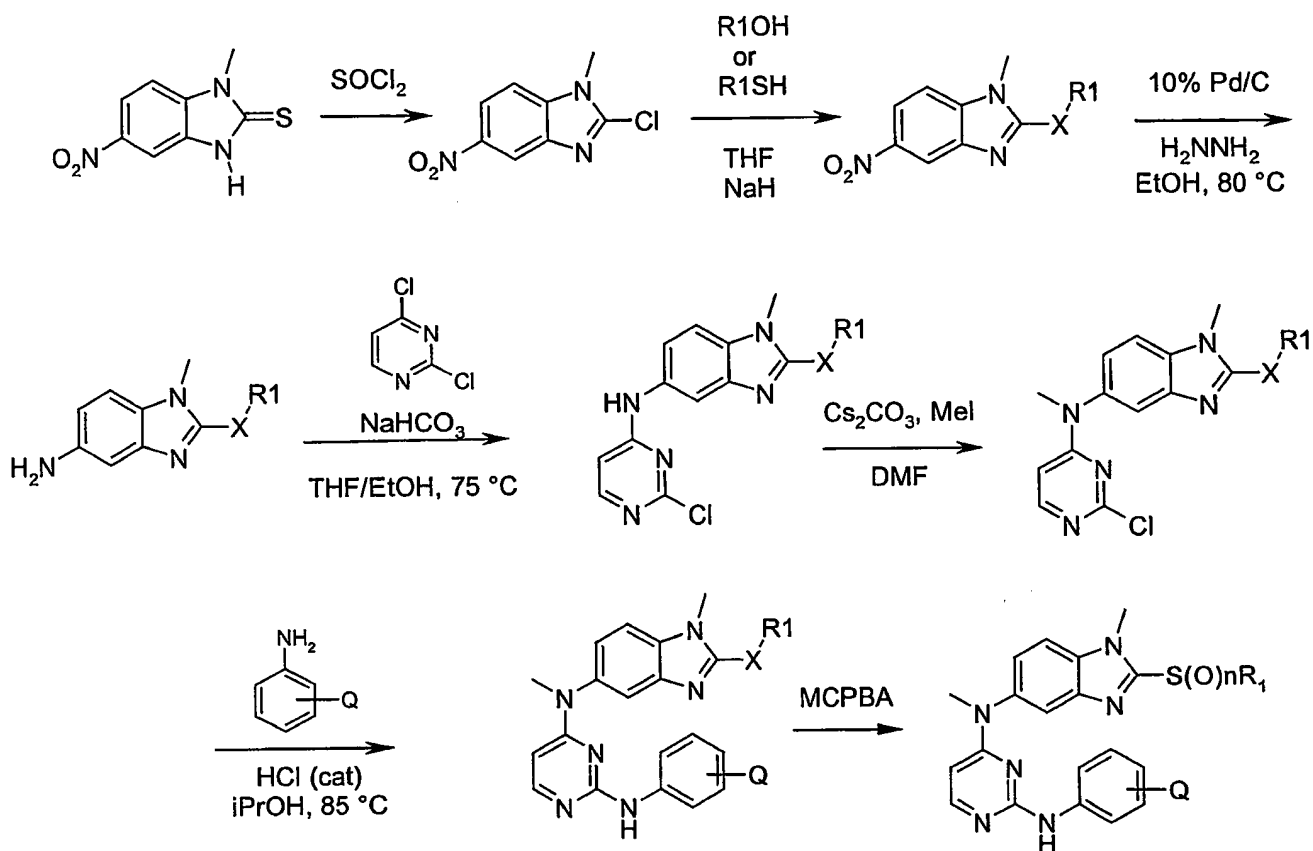
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Scheme 5 illustrates the synthetic scheme for the preparation of 2-alkoxy, 2-phenoxy, and 2-thiophenoxy benzimidazole derivatives of Formula I. That is, those compounds of formula I wherein X is a heteroatom of D as defined above, R<sup>1</sup> is alkoxy, aryloxy, or aralkoxy, n is 1 or 2, and Q represents 1 or more substituents as defined by Q<sub>1</sub>, Q<sub>2</sub>, and Q<sub>3</sub> above.

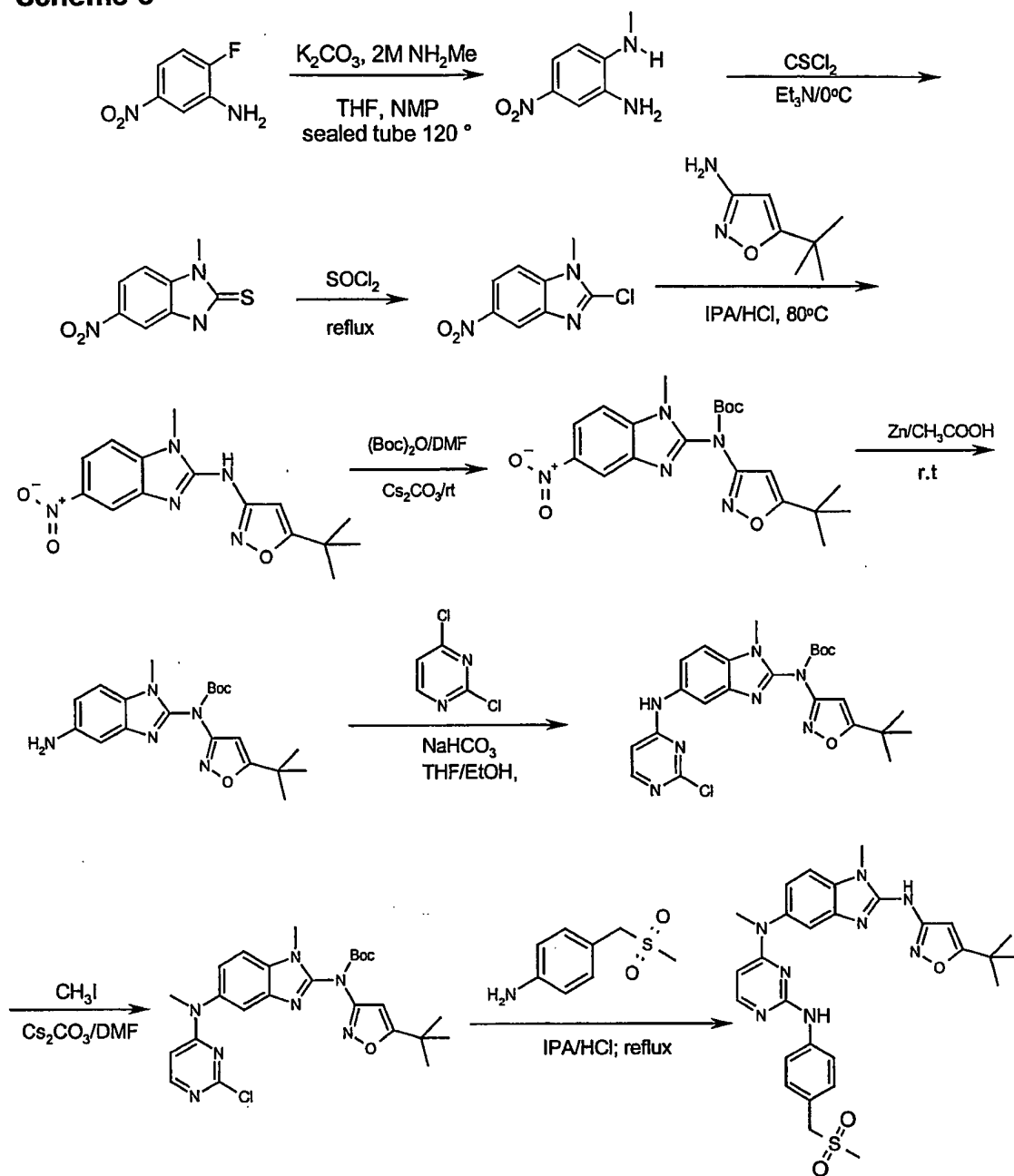
Scheme 5



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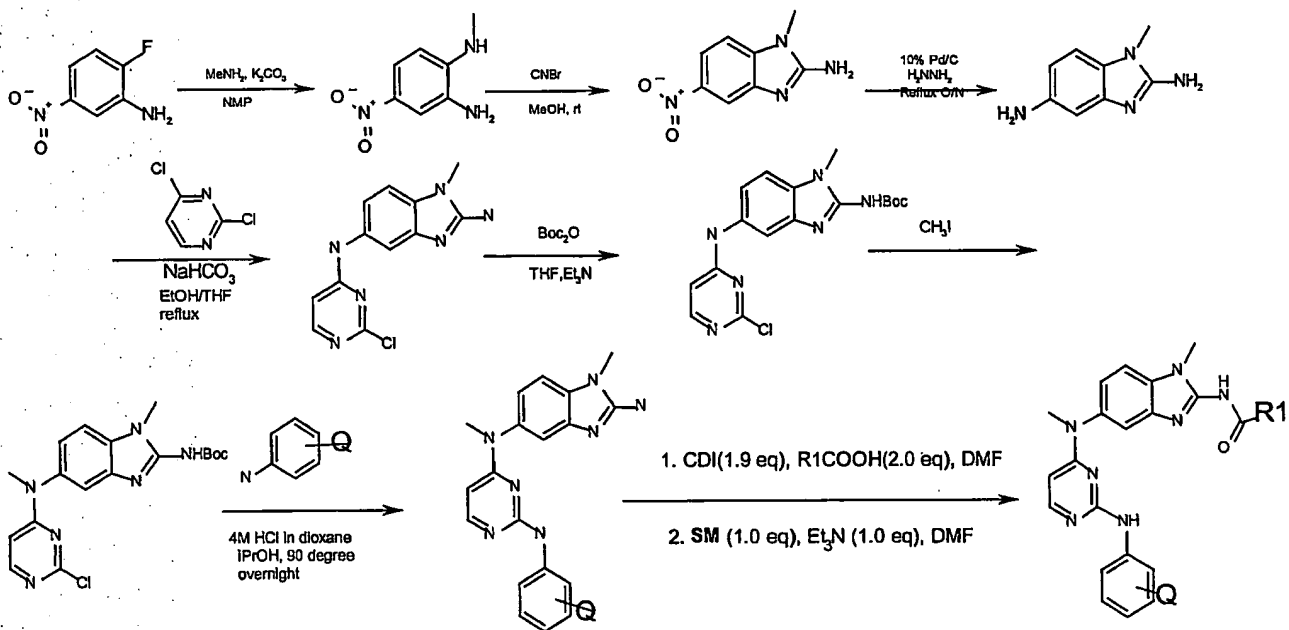
Scheme 6 illustrates the synthetic scheme for the preparation of benzimidazole heteroaryl amine derivatives of formula (I), wherein oxazole is utilized as a specific heteroaryl group:

## Scheme 6



Scheme 7 following illustrates a synthetic scheme for the preparation of benzimidazole amides of formula (I) and (II). R<sup>1</sup> is as defined above and Q represents Q<sub>1</sub>, Q<sub>2</sub>, and/or Q<sub>3</sub> as defined above.

Scheme 7



Certain embodiments of the present invention will now be illustrated by way of example only. The physical data given for the compounds exemplified is consistent with the assigned structure of those compounds.

## EXAMPLES

As used herein the symbols and conventions used in these processes, schemes and examples are consistent with those used in the contemporary scientific literature, for example, the *Journal of the American Chemical Society* or the *Journal of Biological Chemistry*. Standard single-letter or three-letter abbreviations are generally used to designate amino acid residues, which are assumed to be in the L-configuration unless otherwise noted. Unless otherwise noted, all starting materials were obtained from commercial suppliers and used without further purification. Specifically, the following abbreviations may be used in the examples and throughout the specification:

g (grams);

mg (milligrams);

	L (liters);	mL (milliliters);
	μL (microliters);	psi (pounds per square inch);
	M (molar);	mM (millimolar);
	i. v. (intravenous);	Hz (Hertz);
5	MHz (megahertz);	mol (moles);
	mmol (millimoles);	rt (room temperature);
	min (minutes);	h (hours);
	mp (melting point);	TLC (thin layer chromatography);
	T <sub>r</sub> (retention time);	RP (reverse phase);
10	MeOH (methanol);	<i>i</i> -PrOH (isopropanol);
	TEA (triethylamine);	TFA (trifluoroacetic acid);
	TFAA (trifluoroacetic anhydride);	THF (tetrahydrofuran);
	DMSO (dimethylsulfoxide);	AcOEt (ethyl acetate);
	DME (1,2-dimethoxyethane);	DCM (dichloromethane);
15	DCE (dichloroethane);	DMF ( <i>N,N</i> -dimethylformamide);
	DMPU ( <i>N,N'</i> -dimethylpropyleneurea);	CDI (1,1-carbonyldiimidazole);
	IBCF (isobutyl chloroformate);	HOAc (acetic acid);
	HOSu ( <i>N</i> -hydroxysuccinimide);	HOBt (1-hydroxybenzotriazole);
	mCPBA (meta-chloroperoxybenzoic acid);	EDC (ethylcarbodiimide hydrochloride);
20	BOC ( <i>tert</i> -butoxycarbonyl);	Fmoc (9-fluorenylmethoxycarbonyl);
	DCC (dicyclohexylcarbodiimide);	CBZ (benzyloxycarbonyl);
	Ac (acetyl);	atm (atmosphere);
	TMSE (2-(trimethylsilyl)ethyl);	TMS (trimethylsilyl);
	TIPS (triisopropylsilyl);	TBS ( <i>t</i> -butyldimethylsilyl);
25	DMAP (4-dimethylaminopyridine);	BSA (bovine serum albumin)
	ATP (adenosine triphosphate);	HRP (horseradish peroxidase);
	DMEM (Dulbecco's modified Eagle medium);	
	HPLC (high pressure liquid chromatography);	
	BOP (bis(2-oxo-3-oxazolidinyl)phosphinic chloride);	
30	TBAF (tetra- <i>n</i> -butylammonium fluoride);	
	HBTU (O-Benzotriazole-1-yl- <i>N,N,N',N'</i> -tetramethyluronium hexafluorophosphate).	

HEPES (4-(2-hydroxyethyl)-1-piperazine ethane sulfonic acid);  
 DPPA (diphenylphosphoryl azide);  
 fHNO<sub>3</sub> (fumed HNO<sub>3</sub>); and  
 EDTA (ethylenediaminetetraacetic acid).

5

All references to ether are to diethyl ether; brine refers to a saturated aqueous solution of NaCl. Unless otherwise indicated, all temperatures are expressed in °C (degrees Centigrade). All reactions are conducted under an inert atmosphere at room temperature unless otherwise noted.

10

<sup>1</sup>H NMR spectra were recorded on a Varian VXR-300, a Varian Unity-300, a Varian Unity-400 instrument, a Bruker AVANCE-400, or a General Electric QE-300. Chemical shifts are expressed in parts per million (ppm, δ units). Coupling constants are in units of hertz (Hz). Splitting patterns describe apparent multiplicities and are designated as s (singlet), d (doublet), t (triplet), q (quartet), quint (quintet), m (multiplet), br (broad).

15

HPLC were recorded on a Gilson HPLC or Shimazu HPLC system by the following conditions. Column: 50 X 4.6mm (id) stainless steel packed with 5μm Phenomenex Luna C-18 ; Flow rate: 2.0 mL/min; Mobile phase: A phase = 50mM ammonium acetate (pH 7.4), B phase = acetonitrile, 0-0.5min (A: 100%, B: 0%), 0.5-3.0 min (A:100-0%, B:0-100%), 3.0-3.5min (A: 0%, B: 100%), 3.5-3.7 min (A: 0-100%, B: 100-0%), 3.7-4.5 min (A: 100%, B: 0%); Detection : UV 254nm; Injection volume: 3μL .

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25

Low-resolution mass spectra (MS) were recorded on a JOEL JMS-AX505HA, JOEL SX-102, or a SCIEX-APIiii spectrometer; LC-MS were recorded on a micromass 2MD and Waters 2690; high resolution MS were obtained using a JOEL SX-102A spectrometer. All mass spectra were taken under electrospray ionization (ESI), chemical ionization (CI), electron impact (EI) or by fast atom bombardment (FAB) methods. Infrared (IR) spectra were obtained on a Nicolet 510 FT-IR spectrometer using a 1-mm NaCl cell. Additional mass spectra were run on an open access LC/MS system using electrospray ionization. LC conditions: 4.5% to 90% CH<sub>3</sub>CN (0.02% TFA)

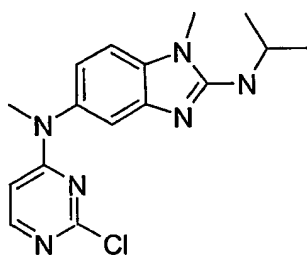
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in 3.2 min with a 0.4 min hold and 1.4 min re-equilibration; detection by MS, UV at 214 nm, and a light scattering detector (ELS). Column: 1 X 40 mm Aquasil (C18).

Most of the reactions were monitored by thin-layer chromatography on 0.25 mm E. Merck silica gel plates (60F-254), visualized with UV light, 5% ethanolic phosphomolybdic acid or p-anisaldehyde solution. Flash column chromatography was performed on silica gel (230-400 mesh, Merck).

### Intermediate Example 1

*N<sup>5</sup>-(2-chloropyrimidin-4-yl)-N<sup>2</sup>-isopropyl-N<sup>5</sup>,1-dimethyl-1H-benzimidazole-2,5-diamine*



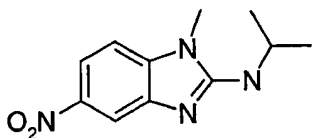
#### A. *N*<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine



To a solution of 2-fluoro-5-nitroaniline (5 g, 32mmol) in 40 ml *N*-methylpyrrolidinone in a sealed reaction vessel was added potassium carbonate (9.0 g, 50.0 mmol) and a solution of methyl amine (32 ml, 2M in THF) and the reaction was heated to 120 °C. After 16 h, the reaction mixture was cooled to room temperature and poured into 400 ml of water. The resulting precipitate was filtered and dried to give the title compound as a red solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.54 (dd, J = 8.7 and 2.7 Hz, 1H), 7.39 (d, J = 2.7 Hz, 1H), 6.41 (d, J = 8.7 Hz, 1H), 6.13 (s, 1H), 5.08 (s, 2H), 2.83 (s, 3H).

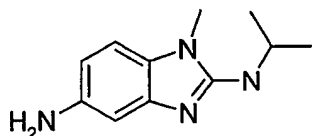


B. *N*-isopropyl-1-methyl-5-nitro-1*H*-benzimidazol-2-amine



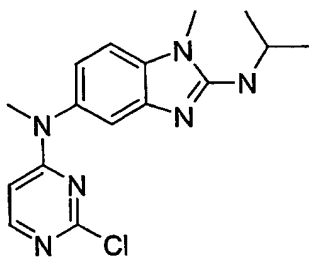
To a solution of *N*<sup>1</sup>-methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12.0 mmol) in pyridine (20 ml) was added isopropyl isothiocyanate (1.41 g, 13.2 mmol) and the mixture was heated to 90 °C. After 1 h, 1-cyclohexyl-3-(2-morpholinoethyl)carbodiimide metho-*p*-toluenesulfonate (6.6 g, 15.6 mmol) was added and the mixture was heated at 90 °C. After 16 h, the reaction mixture was cooled to rt, filtered and concentrated to a red residue. This was dissolved in EtOAc and washed with water (4 x 125 ml). The organic layer was dried over MgSO<sub>4</sub> and concentrated to an orange solid. MeOH was added, and the solid was filtered and dried to give the title compound as an orange solid (2.4 g, 85%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.88 (dd, *J* = 8.7 and 2.4 Hz), 7.30 (d, *J* = 8.7 Hz, 1H), 6.89 (d, *J* = 7.5 Hz, 1H), 4.08 (m, 1H), 3.56 (s, 3), 1.25 (d, *J* = 6.6 Hz, 6H). MS (ESI) *m/z* = 235 [M+H]<sup>+</sup>.

C. *N*<sup>2</sup>-Isopropyl-1-methyl-1*H*-benzimidazole-2,5-diamine



To a solution of isopropyl-(1-methyl-5-nitro-1*H*-benzimidazol-2-yl)-amine (2.15 g, 9.2 mmol) and 10% Pd/C (500 mg) in ethanol (60 ml) was added hydrazine (5 ml) and the reaction was heated to 80 °C. After TLC showed the starting material to be consumed, the reaction was cooled to rt and passed through a plug of celite. The filtrate was concentrated to give the title compound as an off-white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 6.75 (d, *J* = 8.1 Hz, 1H), 6.45 (d, *J* = 1.8 Hz, 1H), 6.20 (dd, *J* = 8.1 and 2.1 Hz, 1H), 6.06 (d, *J* = 7.8 Hz, 1H), 4.43 (br s, 2H), 3.96 (m, 1H), 3.35 (s, 3H), 1.19 (d, *J* = 6.6 Hz, 6H).

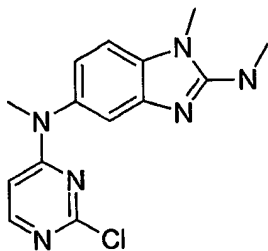
D. *N*<sup>5</sup>-(2-Chloropyrimidin-4-yl)-*N*<sup>2</sup>-isopropyl-*N*<sup>1</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine



- 5 To a solution of *N*<sup>2</sup>-isopropyl-1-methyl-1*H*-benzimidazole-2,5-diamine (1.46 g, 7.2 mmol) in THF (7 ml) and ethanol (21 ml) was added NaHCO<sub>3</sub> (1.81 g, 21.6 mmol) and 2,4-dichloropyrimidine (2.68 g, 18 mmol) and the reaction was heated to 75 °C. After 5 h, the reaction was filtered hot and concentrated to a gray foam. Ether was added and the solid was filtered and dried to give *N*<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-isopropyl-1-methyl-1*H*-benzimidazole-2,5-diamine as an off-white solid.
- 10 *N*<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-isopropyl-1-methyl-1*H*-benzimidazole-2,5-diamine was dissolved in DMF (21ml) and cesium carbonate (6.84 g, 21 mmol) was added. After 15 min, iodomethane (0.70 ml, 11.2 mmol) was added, and the reaction was stirred at rt. After TLC showed the starting material to be consumed, the reaction was
- 15 diluted with water. The aqueous layer was extracted with EtOAc. The combined organic layers were washed with water, dried over MgSO<sub>4</sub> and concentrated to a red foam. The crude material was purified with silica gel to give the title compound as a white solid (1.10 g, 46% over two steps). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.87 (d, J = 6.0 Hz, 1H), 7.22 (d, J = 8.1 Hz, 1H), 7.11 (1.8 Hz, 1H), 6.82 (dd, J = 8.1 and 1.8 Hz, 1H), 6.53 (d, J = 7.5 Hz, 1H), 6.09 (d, J = 6.0 Hz, 1H), 4.04 (m, 1H), 3.51 (s, 3H), 3.37 (s, 3H),
- 20 1.23 (d, J = 6.6 Hz, 6H). MS (ESI) m/z = 331 [M+H]<sup>+</sup>.

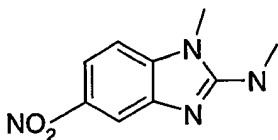
## Intermediate Example 2

*N*<sup>5</sup>-(2-Chloropyrimidin-4-yl)-*N*<sup>2</sup>,*N*<sup>5</sup>,1-trimethyl-1*H*-benzimidazole-2,5-diamine



5

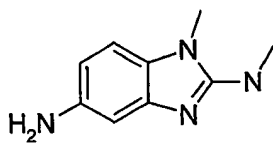
A. Methyl-(1-methyl-5-nitro-1*H*-benzimidazol-2-yl)-amine



*N*<sup>1</sup>-methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12.0 mmol) and methyl isothiocyanate (0.90 ml, 13.2 mmol) were coupled using the procedure of example one part B to give the title compound as a yellow solid (1.32 g, 53%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.98 (d, *J* = 2.1 Hz, 1H), 7.90 (dd, *J* = 8.7 and 2.4 Hz, 1H), 7.32 (d, *J* = 8.7 Hz, 1H), 7.15 (m, 1H), 3.55 (d, 3H), 2.95 (d, *J* = 4.5 Hz, 3H).

10

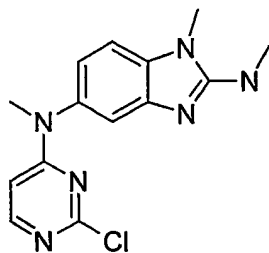
B. *N*<sup>2</sup>,1-Dimethyl-1*H*-benzimidazole-2,5-diamine



15

Methyl-(1-methyl-5-nitro-1*H*-benzimidazol-2-yl)-amine was reduced using the procedure of example one part C to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, CD<sub>3</sub>OD) δ 7.50 (m, 2H), 7.31 (dd, *J* = 8.7 and 2.1 Hz, 1H), 3.13 (s, 3H). MS (ESI) *m/z* = 163 [*M*+*H*]<sup>+</sup>.

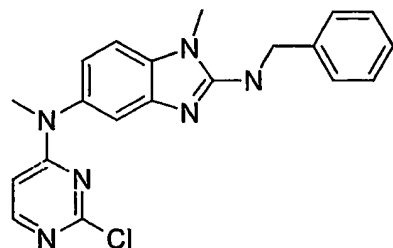
C. *N*<sup>5</sup>-(2-Chloropyrimidin-4-yl)-*N*<sup>2</sup>,*N*<sup>5</sup>,1-trimethyl-1*H*-benzimidazole-2,5-diamine



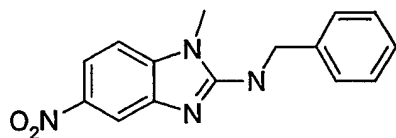
*N*<sup>2</sup>,1-Dimethyl-1*H*-benzimidazole-2,5-diamine was coupled and methylated according to the procedure of example one part D to give the title compound as a white solid. <sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 7.85 (d, *J* = 6.0 Hz, 1H), 7.21 (d, *J* = 8.0 Hz, 1H), 6.92 (dd, *J* = 8.4 and 2.0 Hz, 1H), 6.77 (m, 1H), 6.07 (br s, 1H), 3.48 (s, 3H), 3.36 (s, 3H), 2.89 (d, *J* = 4.4 Hz, 3H).

10 Intermediate Example 3

*N*<sup>2</sup>-Benzyl-*N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>5</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine

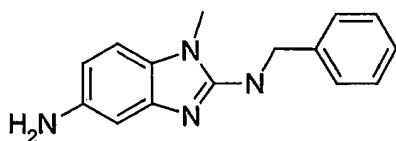


A. *N*-Benzyl-1-methyl-5-nitro-1*H*-benzimidazol-2-amine



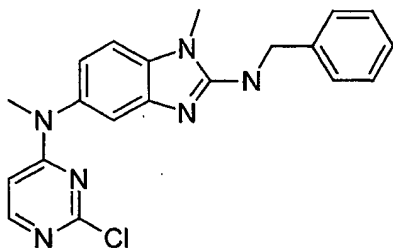
*N*<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12.0 mmol) and benzyl isothiocyanate (1.75 ml, 13.2 mmol) were coupled using the procedure of example one part B to give the title compound as a yellow solid (2.4 g, 71%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.97 (d, *J* = 2.4 Hz, 1H), 7.90 (dd, *J* = 8.7 and 2.4 Hz, 1H), 7.77 (t, *J* = 5.7 Hz, 1H), 7.21 – 7.41 (m, 6H), 4.63 (d, *J* = 5.7 Hz, 2H), 3.62 (s, 3H) ppm.

B. *N*<sup>2</sup>-Benzyl-1-methyl-1*H*-benzimidazole-2,5-diamine



*N*-Benzyl-1-methyl-5-nitro-1*H*-benzimidazol-2-amine (2.4 g, 8.5 mmol) was reduced using the procedure of example one part C to give the title compound as a white foam (2.01 g, 94%). <sup>1</sup>H NMR (300 MHz, DMSO) δ 7.28-7.39 (m, 4H), 7.22 (m, 1H), 7.01 (t, *J* = 5.7 Hz, 1H), 6.79 (d, *J* = 8.1 Hz, 1H), 6.44 (d, *J* = 1.8 Hz, 1H), 6.23 (dd, *J* = 8.2 and 1.9 Hz, 1H), 4.54 (d, *J* = 5.7 Hz, 2H), 3.42 (s, 3H).

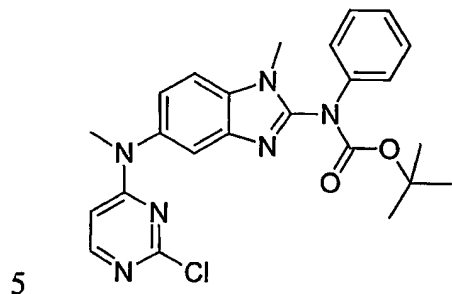
C. *N*<sup>2</sup>-Benzyl-*N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>5</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine



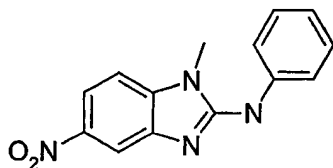
*N*<sup>2</sup>-Benzyl-1-methyl-1*H*-benzimidazole-2,5-diamine (2.01 g, 8 mmol) was coupled and methylated according to the procedure of example one part D to give the title compound as a white solid (1.20 g, 40%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.86 (d, *J* = 6.0 Hz, 1H), 7.23 – 7.46 (m, 7H), 7.11 (d, *J* = 1.8 Hz, 1H), 6.84 (dd, *J* = 8.2 and 1.9 Hz, 1H), 6.08 (d, *J* = 5.4 Hz, 1H), 4.60 (d, *J* = 5.7 Hz, 2H), 3.57 (s, 3H), 3.36 (s, 3H). MS (ESI) *m/z* = 379 [M+H]<sup>+</sup>.

## Intermediate Example 4

*Tert-butyl 5-[(2-chloropyrimidin-4-yl)(methyl)amino]-1-methyl-1H-benzimidazol-2-yl(phenyl)carbamate*

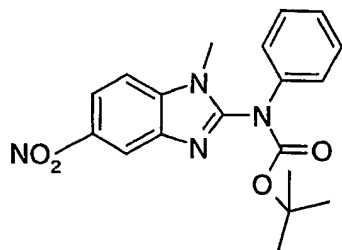


A. *1-Methyl-5-nitro-N-phenyl-1H-benzimidazol-2-amine*



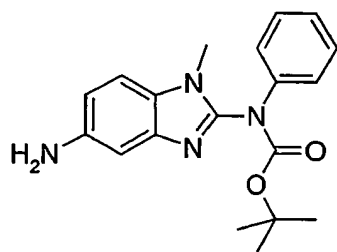
- 10 A solution of phenyl isothiocyanate (1.58 ml, 13.2 mmol) and 1-cyclohexyl-3-(2-morpholinoethyl)carbodiimide metho-*p*-toluenesulfonate (6.6 g, 15.6 mmol) was stirred in pyridine (20 ml) at 90 °C. After 2 hours, *N*<sup>1</sup>-methyl-4-nitro-benzene-1,2-diamine was added and the reaction was heated overnight. The reaction was cooled and concentrated to a red solid. This was dissolved in EtOAc and washed with water.
- 15 The organic layer was dried over MgSO<sub>4</sub> and concentrated to a red solid. This was stirred in MeOH, filtered, and dried to give the title compound as an orange solid (1.97 g, 62%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 8.23 (s, 1H), 8.17 (d, *J* = 1.8 Hz, 1H), 8.02 (dd, *J* = 8.7 and 2.1 Hz, 1H), 7.89 (d, *J* = 8.1 Hz, 2H), 7.50 (d, *J* = 8.7 Hz, 1H), 7.36 (m, 2H), 7.02 (m, 1H), 3.79 (s, 1H) ppm. MS (ESI) *m/z* = 269 [M+H]<sup>+</sup>.

B. *tert*-butyl 1-methyl-5-nitro-1*H*-benzimidazol-2-yl(phenyl)carbamate



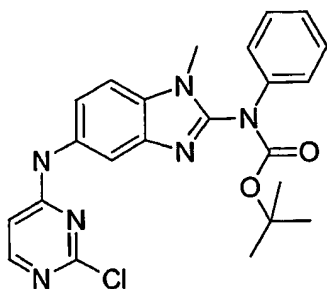
To a solution of *methyl-5-nitro-N-phenyl-1H-benzimidazol-2-amine* (1.97 g, 7.4 mmol) in THF (30 ml) was added cesium carbonate (4.82 g, 14.8 mmol) and di-*tert*-butyl dicarbonate (2.42 g, 11.1 mmol) and the reaction was stirred at rt for 16h. The reaction was diluted with water and extracted with EtOAc. The combined organic layers were washed with water, dried over MgSO<sub>4</sub> and concentrated to a yellow solid. The crude material was purified through silica gel to give the title compound as a yellow solid (1.11 g, 41%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 8.50 (d, J = 2.4 Hz, 1H), 8.23 (dd, J = 9.0 and 2.1 Hz, 1H), 7.84 (d, J = 9.0 Hz, 1H), 7.40 (m, 4H), 7.29 (m, 1H), 3.83 (s, 3H), 1.40 (s, 9H) ppm.

C. *Tert*-butyl 5-amino-1-methyl-1*H*-benzimidazol-2-yl(phenyl)carbamate



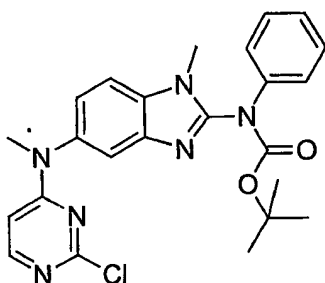
*Tert*-butyl 1-methyl-5-nitro-1*H*-benzimidazol-2-yl(phenyl)carbamate (1.11 g, 3 mmol) was reduced by the procedure of example one part C to give the title compound as a white solid (1.03 g, >95%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.31 – 7.40 (m, 4H), 7.19 – 7.26 (m, 2H), 6.70 (d, J = 1.8 Hz, 1H), 6.63 (dd, J = 8.1 and 1.8 Hz, 1H), 4.78 (br s, 2H), 3.60 (s, 3H), 1.39 (s, 9H).

D. *Tert-butyl 5-[(2-chloropyrimidin-4-yl)amino]-1-methyl-1H-benzimidazol-2-yl(phenyl)carbamate*



5 To a solution of *tert*-butyl 5-amino-1-methyl-1*H*-benzimidazol-2-yl(phenyl)carbamate (1.03 g, 3.0 mmol) in THF (3 ml) and ethanol (9 ml) was added NaHCO<sub>3</sub> (0.76 g, 9.0 mmol) and 2,4-dichloropyrimidine (0.89 g, 6.0 mmol) and the reaction was heated to 75 °C. After 5 h, the reaction was filtered hot and concentrated to a gray foam. The crude material was purified on silica gel to give the  
10 title compound as a white foam (0.98 g, 73%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.00 (s, 1H), 8.10 (d, *J* = 5.7 Hz, 1H), 7.89 (s, 1H), 7.58 (d, *J* = 9.0 Hz, 1H), 7.36 – 7.39 (m, 5H), 7.24 – 7.34 (m, 1H), 6.70 (d, *J* = 6.0 Hz, 1H), 3.73 (s, 3H), 1.40 (s, 9H).

15 E. *Tert-butyl 5-[(2-chloropyrimidin-4-yl)(methyl)amino]-1-methyl-1H-benzimidazol-2-yl(phenyl)carbamate*



*Tert*-butyl 5-[(2-chloropyrimidin-4-yl)amino]-1-methyl-1*H*-benzimidazol-2-yl(phenyl)carbamate (0.97 g, 2.2 mmol) was dissolved in DMF (10 ml) and cesium carbonate (2.15 g, 6.6 mmol) was added. After 15 min, iodomethane (0.20 ml, 3.3 mmol) was added, and the reaction was stirred at rt. After TLC showed the starting material to be consumed, the reaction was diluted with water. The aqueous layer was extracted with EtOAc. The combined organic layers were washed with water, dried  
25 over MgSO<sub>4</sub> and concentrated to a red foam. The crude material was purified through

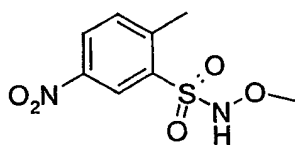


silica gel to give the title compound as a white solid (0.80 g, 78% over two steps).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  7.90 (d,  $J$  = 6.3 Hz, 1H), 7.72 (d,  $J$  = 8.7 Hz, 1H), 7.60 (d,  $J$  = 1.8 Hz, 1H), 7.38 (m, 4H), 7.25 – 7.29 (m, 2H), 6.17 (d,  $J$  = 5.7 Hz, 1H), 3.78 (s, 3H), 3.41 (s, 3H), 1.41 (s, 9H). MS (ESI)  $m/z$  = 465  $[\text{M}+\text{H}]^+$ .

5

### Intermediate Example 5

#### *N*-Methoxy-2-methyl-5-nitrobenzenesulfonamide

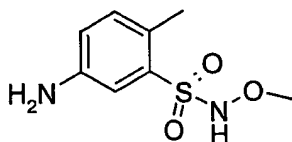


10

4-Nitrotoluene (15 g, 73 mmol) was added to cold chlorosulfonic acid (25 mL, 365 mmol) in 0.5 g portions over a period of 10 min. The solution was stirred in the ice bath for 10 min then placed in a 65 °C oil bath and heated to 7 h open to the air. The resulting dark brown solution was cooled to rt, then slowly poured onto an ice water solution (400 mL). The aqueous suspension was extracted with EtOAc. The organics were dried with  $\text{MgSO}_4$ , and concentrated to a brown oil, which was dissolved in 1,4-dioxane (100 mL) and combined with methoxylamine hydrochloride (50 mL of a 25% aqueous solution, 165 mmol, Aldrich). This solution was cooled in an ice bath, and treated with triethylamine (30 mL), then stirred at rt for 18 hr. Ice water was added (100 mL) and the solution was extracted with EtOAc. The organics were dried with  $\text{MgSO}_4$ , and concentrated to a brown solid (16 g, 67 mmol).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  10.9 (s, 1H), 8.58 (s, 1H), 8.42 (d,  $J$  = 8.4 Hz, 1H), 7.76 (d,  $J$  = 8.4 Hz, 1H), 3.68 (s, 3H), 2.72 (s, 3H).

20

## Intermediate Example 6

*5-Amino-N-methoxy-2-methylbenzenesulfonamide*

5

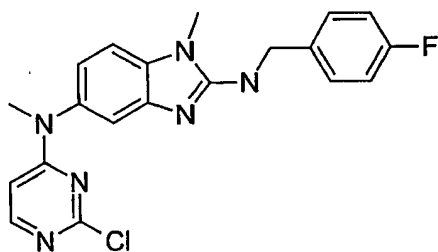
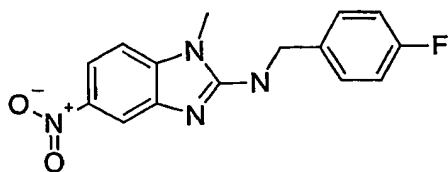
*N*-Methoxy-2-methyl-5-nitrobenzenesulfonamide (0.5 g, 2 mmol) was combined with 10% palladium on carbon (0.05 g), ethanol (10 mL), and hydrazine (1 mL) and heated at reflux for 18 h. The solution was filtered through celite, concentrated, and purified on silica gel with methanol in dichloromethane. Product was an off white solid (0.28 g, 1.3 mmol). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.3 (s, 1H), 7.11 (s, 1H), 7.02 (d, J = 8.2 Hz, 1H), 6.7 (d, J = 8.2 Hz, 1H), 5.37 (s, 2H), 3.57 (s, 3H), 2.38 (s, 3H).

10

## Intermediate Example 7

*N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(4-fluoro-benzyl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine

15

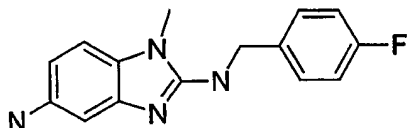
A. (4-Fluoro-benzyl)-(1-methyl-5-nitro-1*H*-benzoimidazol-2-yl)-amine

20

*N*<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12 mmol) and 4-fluorobenzyl isothiocyanate (2.21 g, 13.2 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (2.16 g, 60%). <sup>1</sup>H

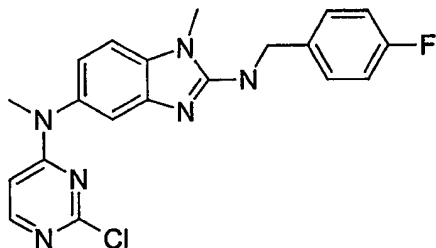
NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  7.96 (d,  $J$  = 1.8 Hz, 1H), 7.89 (dd,  $J$  = 6.6 and 1.8 Hz, 1H), 7.76 (t,  $J$  = 4.5 Hz, 1H), 7.42 (m, 2H), 7.34 (d,  $J$  = 6.6 Hz, 1H), 7.13 (t,  $J$  = 6.6 Hz, 2H), 4.59 (d,  $J$  = 4.5 Hz, 2H), 3.60 (s, 3H).

5                    B. *N*<sup>2</sup>-(4-Fluoro-benzyl)-1-methyl-1H-benzoimidazole-2,5-diamine



(4-Fluoro-benzyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine (2.16 g, 7.2 mmol) was reduced using the procedure of intermediate example one part C to give the title compound as a white solid (1.77 g, 70%). <sup>1</sup>H NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  7.39-7.44 (m, 2H), 7.10-7.16 (m, 2H), 6.96-6.99 (m, 1H), 6.79 (d,  $J$  = 8.1 Hz, 1H), 6.44 (d,  $J$  = 2.1 Hz, 1H), 6.23 (dd,  $J$  = 8.1 and 1.8 Hz, 1H), 4.51 (s, 2H), 3.93 (s, 2H), 3.41 (s, 3H).

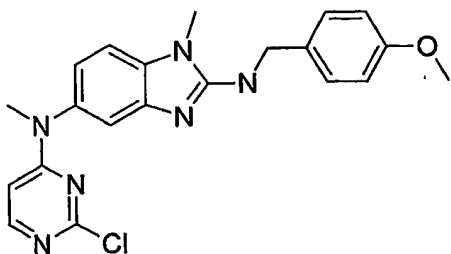
15                    C. *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(4-fluoro-benzyl)-1,*N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine



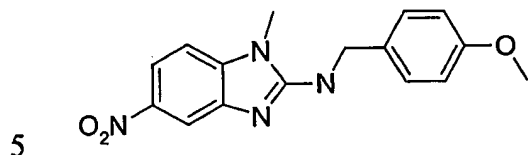
*N*<sup>2</sup>-(4-Fluoro-benzyl)-1-methyl-1H-benzoimidazole-2,5-diamine was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a white solid (603 mg, 23% over two steps). <sup>1</sup>H NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  7.86 (d,  $J$  = 6.0 Hz, 1H), 7.40-7.47 (m, 3H), 7.26 (d,  $J$  = 8.1 Hz, 1H), 7.11-7.17 (m, 3H), 6.85 (dd,  $J$  = 8.1 and 1.8 Hz, 1H), 6.08 (d,  $J$  = 5.4 Hz, 1H), 4.57 (d,  $J$  = 5.7 Hz, 2H), 3.56 (s, 3H), 3.37 (s, 3H). MS (ESI)  $m/z$  = 397  $[M+H]^+$ .

Intermediate Example 8

*N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(4-methoxy-benzyl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine



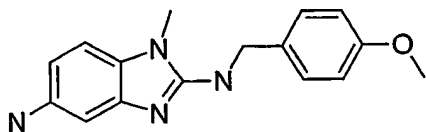
A. (4-Methoxy-benzyl)-(1-methyl-5-nitro-1*H*-benzoimidazol-2-yl)-amine



*N*<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12 mmol) and 4-methoxybenzyl isothiocyanate (2.37 g, 13.2 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (2.00 g, 41%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.98 (d, *J* = 2.1 Hz, 1H), 7.90 (dd, *J* = 8.7 and 2.1 Hz, 1H), 7.68 (t, *J* = 5.7 Hz, 1H), 7.32-7.35 (m, 3H), 6.859 (d, *J* = 8.7 Hz, 2H), 4.55 (d, *J* = 5.7 Hz, 2H), 3.72 (s, 3H), 3.61 (s, 3H).

10

B. *N*<sup>2</sup>-(4-Methoxy-benzyl)-1-methyl-1*H*-benzoimidazole-2,5-diamine

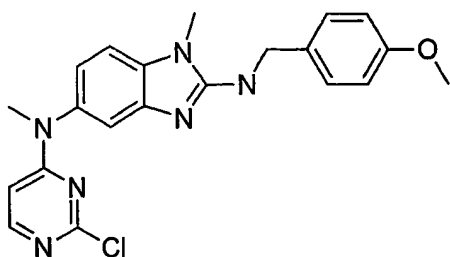


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(4-Methoxy-benzyl)-(1-methyl-5-nitro-1*H*-benzoimidazol-2-yl)-amine (1.99 g, 4.9 mmol) was reduced using the procedure of intermediate example one part C to give the title compound as a white solid (1.68 g, 91%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.30 (d, *J* = 8.1 Hz, 2H), 6.87 (m, 3H), 6.78 (d, *J* = 8.4 Hz, 1H), 6.45 (s, 1H), 6.22 (d, *J* = 8.1 Hz, 1H), 4.45 (d, *J* = 2.1 Hz, 2H), 4.21 (br s, 2H), 3.71 (s, 3H), 3.39 (s, 3H).

20

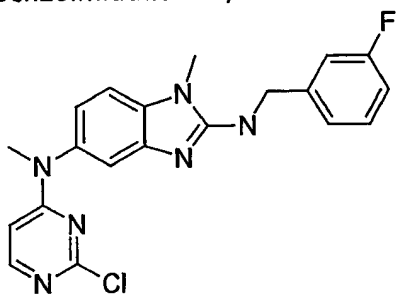
C. *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(4-methoxy-benzyl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine



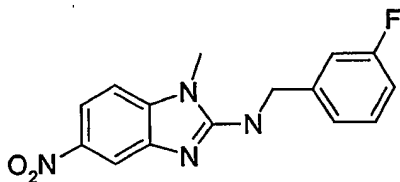
N²-(4-Methoxy-benzyl)-1-methyl-1H-benzoimidazole-2,5-diamine was coupled and  
 methylated according to the procedure of intermediate example one part D to give  
 5 the title compound as an off-white solid ( 910 mg, 51% over two steps). <sup>1</sup>H NMR (300  
 MHz, d<sub>6</sub>-DMSO) δ 7.86 (d, J = 6.0 Hz, 1H), 7.30-7.37 (m, 3H), 7.24 (d, J = 8.1 Hz, 1H),  
 7.11 (d, J = 1.5 Hz, 1H), 6.82-6.89 (M, 3H), 6.09 (d, J = 5.4 Hz, 1H), 4.52 (d, J = 5.7 Hz,  
 2H), 3.72 (s, 3H), 3.55 (s, 3H), 3.37 (s, 3H). MS (ESI) m/z = 409 [M+H]<sup>+</sup>.

#### 10 Intermediate Example 9

*N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(3-fluoro-benzyl)-1,*N*<sup>5</sup>-dimethyl-1H-  
 benzoimidazole-2,5-diamine



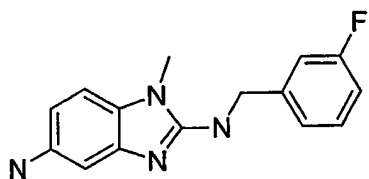
A. (3-Fluoro-benzyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine



15

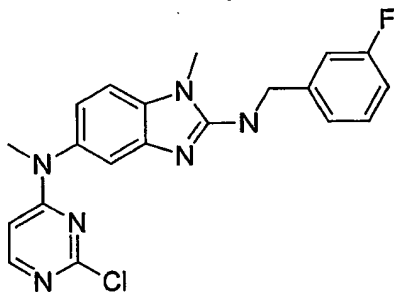
N¹-Methyl-4-nitro-benzene-1,2-diamine (1.4 g, 8.4 mmol) and 3-fluorobenzyl  
 isothiocyanate (1.26 ml, 9.2 mmol) were coupled using the procedure of intermediate  
 example one part B to give the title compound as a yellow solid (1.40 g, 56%). <sup>1</sup>H  
 20 NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.98 (d, J = 2.1 Hz, 1H), 7.92 (dd, J = 8.4 and 2.1 Hz, 1H),  
 7.81 (t, J = 5.7 Hz, 1H), 7.34-7.41 (m, 2H), 7.20-7.25 (M, 2H), 7.07 (td, J = 8.7 and 2.4  
 Hz, 1H), 4.65 (d, J = 5.7 Hz, 2H), 3.64 (s, 3H).

B. *N*<sup>2</sup>-(3-Fluoro-benzyl)-1-methyl-1*H*-benzoimidazole-2,5-diamine



(3-Fluoro-benzyl)-(1-methyl-5-nitro-1*H*-benzoimidazol-2-yl)-amine (1.39 g, 4.6 mmol) was reduced using the procedure of intermediate example one part C to give the title compound as a white solid (1.12 g, 90%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.30-7.38 (m, 1H), 7.16-7.22 (m, 2H), 7.00-7.06 (m, 2H), 6.79 (d, *J* = 8.4 Hz, 1H), 6.43 (d, *J* = 1.8 Hz, 1H), 6.23 (dd, *J* = 8.1 and 2.1 Hz, 1H), 4.54 (d, *J* = 4.5 Hz, 2H), 4.42 (br s, 2H), 3.42 (s, 3H).

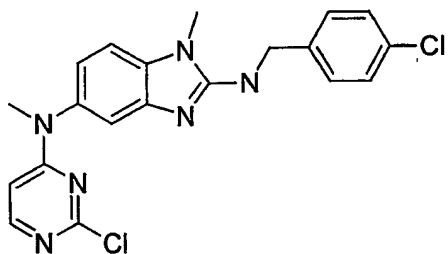
C. *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(3-fluoro-benzyl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine



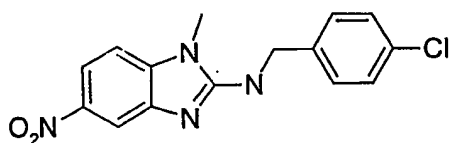
*N*<sup>2</sup>-(3-Fluoro-benzyl)-1-methyl-1*H*-benzoimidazole-2,5-diamine was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a yellow solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.85 (d, *J* = 6.0 Hz, 1H), 7.48 (t, *J* = 6.0 Hz, 1H), 7.32-7.39 (m, 1H), 7.17-7.27 (m, 3H), 7.11 (d, *J* = 1.8 Hz, 1H), 7.04 (m, 1H), 6.85 (dd, *J* = 8.1 and 1.8 Hz, 1H), 6.07 (d, *J* = 5.7 Hz, 1H), 4.60 (d, *J* = 6.0 Hz, 2H), 3.58 (s, 3H), 3.36 (s, 3H).

Intermediate Example 10

*N*<sup>2</sup>-(4-Chloro-benzyl)-*N*<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine

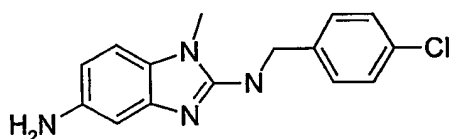


A. (4-Chloro-benzyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine



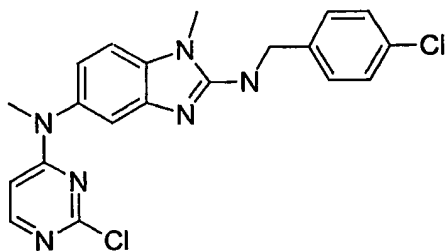
N<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12.0 mmol) and 4-chlorobenzyl isothiocyanate (2.42 g, 13.2 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (2.82 g, 74%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.96 (d, J = 2.1 Hz, 1H), 7.90 (dd, J = 8.7 and 2.4 Hz, 1H), 7.98 (t, J = 6.0 Hz, 1H), 7.33-7.43 (m, 5H), 4.60 (d, J = 5.7 Hz, 2H), 3.61 (s, 3H). MS (ESI) m/z = 317 [M+H]<sup>+</sup>.

10 B. N<sup>2</sup>-(4-Chloro-benzyl)-1-methyl-1H-benzoimidazole-2,5-diamine



(4-Chloro-benzyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine (2.82 g, 8.9 mmol) was reduced following the procedure of intermediate example one part C to give the title compound as a white solid (2.43 g, 96%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.33-7.41 (m, 4H), 7.00 (m, 1H), 6.78 (d, J = 8.1 Hz, 1H), 6.43 (d, J = 1.8 Hz, 1H), 6.22 (dd, J = 8.4 and 1.8 Hz, 1H), 4.51 (m, 2H), 3.40 (s, 3H).

C. N<sup>2</sup>-(4-Chloro-benzyl)-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine

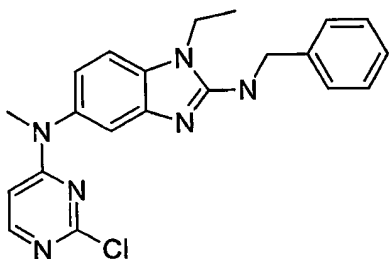


20 N<sup>2</sup>-(4-Chloro-benzyl)-1-methyl-1H-benzoimidazole-2,5-diamine (2.43 g, 8.5 mmol) was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a pink solid (1.93 g, 55%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.85 (d, J = 6.0 Hz, 1H), 7.47 (t, J = 5.7 Hz, 1H), 7.34-7.42 (M, 4H), 7.25 (d, J =

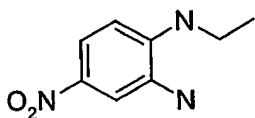
8.4 Hz, 1H), 7.10 (s, 1H), 6.83 (d,  $J = 8.4$  Hz, 1H), 6.01 (d,  $J = 4.8$  Hz, 1H), 4.57 (d,  $J = 5.7$  Hz, 2H), 3.56 (s, 3H), 3.35 (s, 3H). MS (ESI)  $m/z = 413$   $[M+H]^+$ .

### Intermediate Example 11

- 5 *N*<sup>2</sup>-Benzyl-*N*<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1-ethyl-*N*<sup>5</sup>-methyl-1*H*-benzoimidazole-2,5-diamine



#### A. *N*-Ethyl-4-nitro-benzene-1,2-diamine

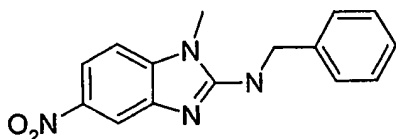


10

2-fluoro-5-nitroaniline (5 g, 32 mmol) and a solution of ethyl amine (32 ml, 2M in THF) were coupled according to the procedure of intermediate example one part A to give the title compound as a dark red solid (4.16 g, 72%). <sup>1</sup>H NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  7.51 (dd,  $J = 8.7$  and 2.7 Hz, 1H), 7.38 (d,  $J = 2.7$  Hz, 1H), 6.44 (d,  $J = 8.7$  Hz, 1H), 5.86 (t,  $J = 4.6$  Hz, 1H), 5.15 (s, 2H), 3.20 (m, 2H), 1.21 (t,  $J = 7.2$  Hz, 3H).

15

#### B. Benzyl-(1-ethyl-5-nitro-1*H*-benzoimidazol-2-yl)-amine

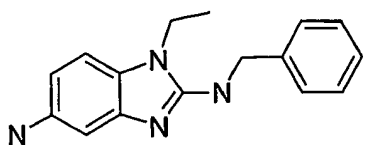


*N*-Ethyl-4-nitro-benzene-1,2-diamine (2.0 g, 11.0 mmol) and benzyl isothiocyanate (1.60 ml, 12.1 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (2.0 g, 61%). <sup>1</sup>H NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  7.96 (d,  $J = 2.1$  Hz, 1H), 7.89 (dd,  $J = 8.7$  and 2.1 Hz, 1H), 7.80 (t,  $J = 5.7$  Hz, 1H), 7.21-7.39 (m, 6H), 4.63 (d,  $J = 5.7$  Hz, 2H), 4.16 (q,  $J = 6.9$  Hz, 2H), 1.24 (t,  $J = 6.9$  Hz, 3H).

25

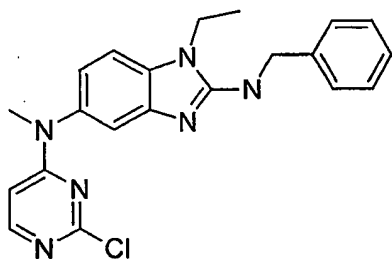
#### C. *N*<sup>2</sup>-Benzyl-1-ethyl-1*H*-benzoimidazole-2,5-diamine





Benzyl-(1-ethyl-5-nitro-1H-benzoimidazol-2-yl)-amine (2.0 g, 6.7 mmol) was reduced following the procedure of intermediate example one part C to give the title compound as a white solid (1.6 g, 90%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.24–7.38 (m, 4H), 7.21 (M, 1H), 6.99 (m, 1H), 6.80 (d, J = 8.1 Hz, 1H), 6.44 (d, J = 1.8 Hz, 1H), 6.22 (dd, J = 8.1 and 1.8 Hz, 1H), 4.55 (s, 2H), 4.20 (br s, 2H), 3.94 (q, J = 7.2 Hz, 2H), 1.17 (t, J = 7.2 Hz, 3H).

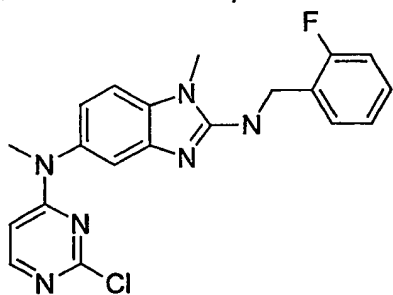
D. *N*<sup>2</sup>-Benzyl-*N*<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1-ethyl-*N*<sup>5</sup>-methyl-1H-benzoimidazole-2,5-diamine



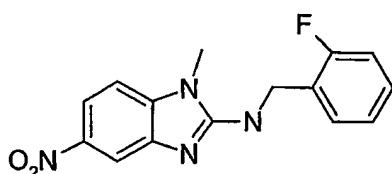
*N*<sup>2</sup>-Benzyl-1-ethyl-1H-benzoimidazole-2,5-diamine (1.6 g, 6 mmol) was coupled and methylated following the procedure of intermediate example one part D to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.86 (d, J = 6.0 Hz, 1H), 7.47 (t, J = 6.0 Hz, 1H), 7.22–7.39 (m, 6H), 7.11 (d, J = 1.8 Hz, 1H), 6.84 (dd, J = 8.1 and 1.8 Hz, 1H), 6.11 (d, J = 5.7 Hz, 1H), 4.61 (d, J = 5.7 Hz, 2H), 4.11 (q, J = 7.2 Hz, 2H), 3.37 (s, 3H), 1.25 (t, J = 7.2 Hz, 3H). MS (ESI) *m/z* = 393 [M+H]<sup>+</sup>.

Intermediate Example 12

*N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(2-fluoro-benzyl)-1,*N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine

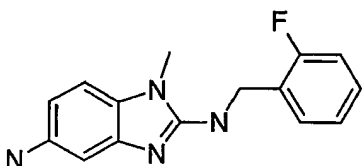


A. (2-Fluoro-benzyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine



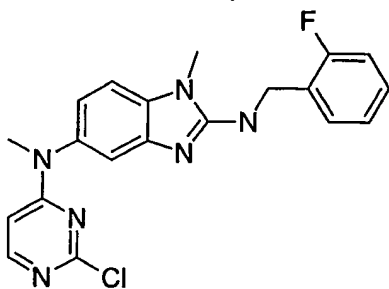
*N*<sup>1</sup>-Methyl-4-nitro-1H-benzoimidazole-2,5-diamine (2.0 g, 12 mmol) and 2-fluorobenzyl isothiocyanate (1.81 ml, 13.2 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (2.0 g, 56%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.98 (s, 1H), 7.92 (d, J = 8.7 Hz, 1H), 7.76 (t, J = 5.7 Hz, 1H), 7.47 (m, 1H), 7.28-7.38 (m, 2H), 7.13-7.23 (m, 2H), 4.67 (d, J = 5.7 Hz, 2H), 3.64 (s, 3H). MS (ESI) m/z = 543 [M+H]<sup>+</sup>.

B. *N*<sup>2</sup>-(2-Fluoro-benzyl)-1-methyl-1H-benzoimidazole-2,5-diamine



(2-Fluoro-benzyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine was reduced following the procedure of intermediate example one part C to give the title compound as a white solid (1.74 g, 97%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.42-7.47 (m, 1H), 7.26-7.30 (m, 1H), 7.11-7.10 (m, 2H), 6.97-7.01 (m, 1H), 6.80 (d, J = 8.1 Hz, 1H), 6.44 (d, J = 2.1 Hz, 1H), 6.24 (dd, J = 8.2 and 2.2 Hz, 1H), 5.00 (br s, 2H) 4.58 (m, 2H), 3.43 (s, 3H).

C. *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(2-fluoro-benzyl)-1,*N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine

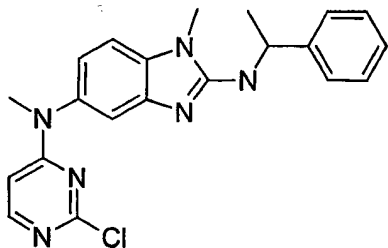


*N*<sup>2</sup>-(2-Fluoro-benzyl)-1-methyl-1H-benzoimidazole-2,5-diamine was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.86 (d, J = 6.3 Hz,

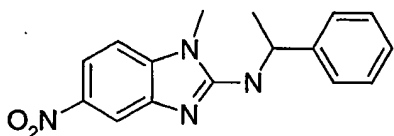
1H), 7.41-7.48 (M, 2H), 7.26-7.31 (m, 2H), 7.12-7.22 (m, 3H), 6.86 (dd, J = 8.1 and 1.8 Hz, 1H), 6.08 (d, J = 5.7 Hz, 1H), 4.64 (d, J = 5.7 Hz, 2H), 3.59 (s, 3H), 3.37 (s, 3H). MS (ESI) m/z = 397 [M+H]<sup>+</sup>.

### 5 Intermediate Example 13

*N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(1-phenyl-ethyl)-1*H*-benzoimidazole-2,5-diamine

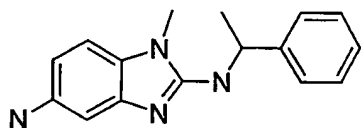


### 10 A. (1-Methyl-5-nitro-1*H*-benzoimidazol-2-yl)-(1-phenyl-ethyl)-amine



*N*<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12 mmol) and 1-phenylethyl isothiocyanate (2.15 g, 13.2 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (1.2 g, 34%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.87-7.94 (m, 2H), 7.44-7.52 (m, 3H), 7.29-7.34 (m, 3H), 7.21 (m, 1H), 5.18 (m, 1H), 3.65 (s, 3H), 1.55 (d, J = 6.9 Hz, 3H).

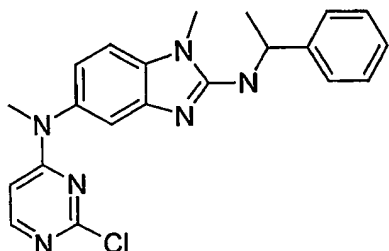
### B. 1-Methyl-*N*<sup>2</sup>-(1-phenyl-ethyl)-1*H*-benzoimidazole-2,5-diamine



(1-Methyl-5-nitro-1*H*-benzoimidazol-2-yl)-(1-phenyl-ethyl)-amine was reduced following the procedure of intermediate example one part C to give the title compound as a white solid (1.2 g, 97%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.42 (d, J = 7.5 Hz, 2H), 7.27-7.32 (m, 2H), 7.18-7.21 (m, 1H), 6.70-6.78 (m, 2H), 6.40 (d, J = 1.8 Hz,

1H), 6.21 (dd,  $J = 8.2$  and  $2.0$  Hz, 1H), 5.09 (m, 1H), 4.37 (br s, 2H), 3.44 (s, 3H), 1.49 (d,  $J = 7.2$  Hz, 3H).

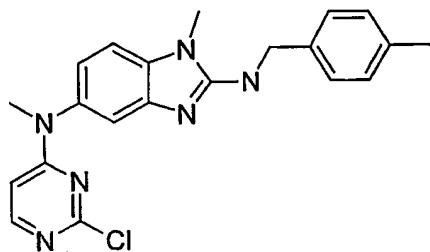
5 C. *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(1-phenyl-ethyl)-1*H*-benzoimidazole-2,5-diamine



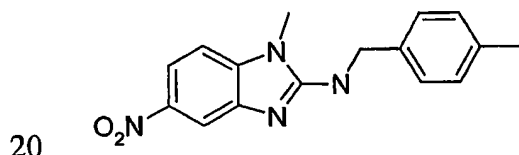
1-Methyl-*N*<sup>2</sup>-(1-phenyl-ethyl)-1*H*-benzoimidazole-2,5-diamine was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a yellow foam. <sup>1</sup>H NMR (300 MHz, *d*<sub>6</sub>-DMSO)  $\delta$  7.84 (d,  $J = 6.3$  Hz, 1H), 7.44 (d,  $J = 7.5$  Hz, 2H), 7.28-7.34 (m, 2H), 7.16-7.25 (m, 3H), 7.07 (d,  $J = 1.8$  Hz, 1H), 6.83 (dd,  $J = 8.1$  and  $1.8$  Hz, 1H), 6.06 (d,  $J = 5.7$  Hz, 1H), 5.14 (m, 1H), 3.60 (s, 3H), 3.35 (s, 3H). MS (ESI)  $m/z = 393$  [M+H]<sup>+</sup>.

Intermediate Example 14

15 *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(4-methyl-benzyl)-1*H*-benzoimidazole-2,5-diamine hydrochloride



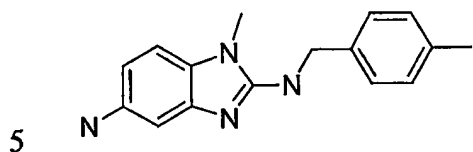
A. (4-Methyl-benzyl)-(1-methyl-5-nitro-1*H*-benzoimidazol-2-yl)-amine



*N*<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12 mmol) and 4-methylbenzyl isothiocyanate (2.15 g, 13.2 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (2.1 g, 59%). <sup>1</sup>H NMR (300 MHz, *d*<sub>6</sub>-DMSO)  $\delta$  7.97 (d,  $J = 2.4$  Hz, 1H), 7.90 (dd,  $J = 8.7$  and  $2.1$  Hz, 1H), 7.71 (t,

$J = 6.0$  Hz, 1H), 7.34 (d,  $JH = 8.7$  Hz, 1H), 7.28 (d,  $J = 7.8$  Hz, 2H), 7.13 (d,  $J = 8.1$  Hz, 2H), 4.58 (d,  $J = 6.0$  Hz, 2H), 3.61 (s, 3H), 2.27 (s, 3H).

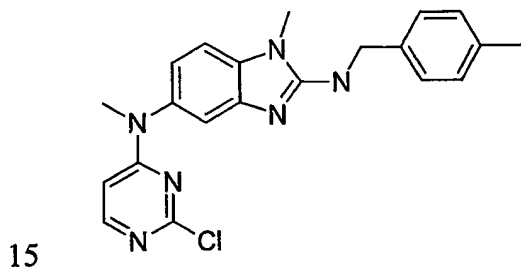
B. 1-Methyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine



(4-Methyl-benzyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine was reduced following the procedure of intermediate example one part C to give the title compound as a white solid (1.8 g, 95%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  7.26 (d,  $J = 8.1$  Hz, 2H), 7.11 (d,  $J = 7.8$  Hz, 2H), 6.88 (t,  $J = 6.0$  Hz, 1H), 6.77 (d,  $J = 8.1$  Hz, 1H), 6.43 (d,  $J = 1.8$  Hz, 1H), 6.22 (dd,  $J = 8.1$  and 2.1 Hz, 1H), 4.48 (d,  $J = 5.7$  Hz, 2H), 4.37 (s, 2H), 3.40 (s, 3H), 2.26 (s, 3H).

10

C.  $N^5$ -(2-Chloro-pyrimidin-4-yl)-1, $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine



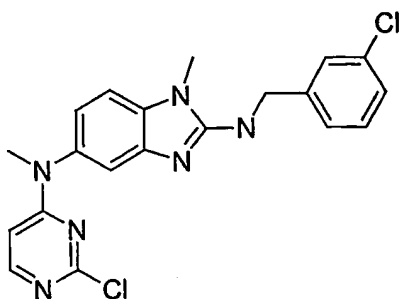
1-Methyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a white solid.  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  7.86 (d,  $J = 6.0$  Hz, 1H), 7.38 (t,  $J = 6.0$  Hz, 1H), 7.23-7.28 (m, 3H), 7.11-7.13 (m, 3H), 6.84 (dd,  $J = 8.1$  and 1.8 Hz, 1H), 6.08 (d,  $J = 5.4$  Hz, 1H), 4.54 (d,  $J = 5.7$  Hz, 2H), 3.56 (s, 3H), 3.37 (s, 3H), 2.26 (s, 3H). MS (ESI)  $m/z = 393$   $[M+H]^+$ .

20

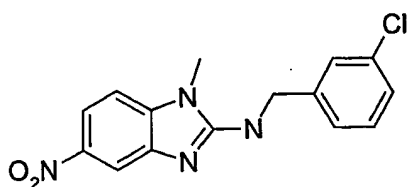
Intermediate Example 15

$N^2$ -(3-Chloro-benzyl)- $N^5$ -(2-chloro-pyrimidin-4-yl)-1, $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine

25



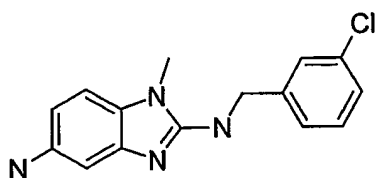
A. (3-Chloro-benzyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine



- 5 N¹-Methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12.0 mmol) and 3-chlorobenzyl isothiocyanate (1.94 ml, 13.2 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (2.2 g, 58%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.98 (d, J = 2.1 Hz, 1H), 7.90-7.93 (m, 1H), 7.82 (t, J = 5.7 Hz, 1H), 7.46 (s, 1H), 7.30-7.38 (m, 4H), 4.63 (d, J = 5.7 Hz, 2H), 3.64 (s, 3H).

10

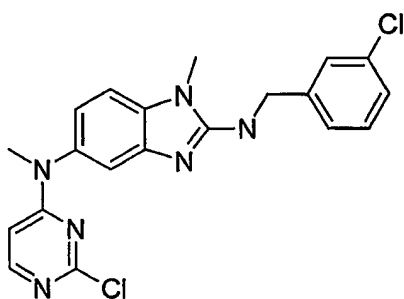
B. N²-(3-Chloro-benzyl)-1-methyl-1H-benzoimidazole-2,5-diamine



- (3-Chloro-benzyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine was reduced following the procedure of intermediate example one part C to give the title compound as a white solid (0.67 g, 34%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.22-7.43 (m, 5H), 6.80 (m, 1H), 6.44 (d, J = 1.8 Hz, 1H), 6.23 (m, 1H), 4.54 (s, 2H), 3.42 (s, 3H).

15

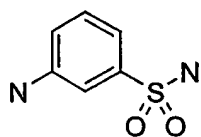
C. N²-(3-Chloro-benzyl)-N⁵-(2-chloro-pyrimidin-4-yl)-1,N⁵-dimethyl-1H-benzoimidazole-2,5-diamine



N<sup>2</sup>-(3-Chloro-benzyl)-1-methyl-1H-benzimidazole-2,5-diamine was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.86 (d, J = 6.0 Hz, 1H), 7.24–7.52 (m, 6H), 7.12 (m, 1H), 6.86 (dd, J = 8.1 and 2.1 Hz, 1H), 6.09 (d, J = 5.4 Hz, 1H), 4.60 (d, J = 5.7 Hz, 2H), 3.58 (s, 3H), 3.37 (s, 3H). MS (ESI) m/z = 413 [M+H]<sup>+</sup>.

### Intermediate Example 16

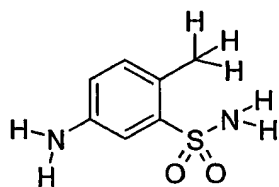
#### 3-amino-benzenesulfonamide



The title compound is commercially available; CAS # 98-18-0.

### Intermediate Example 17

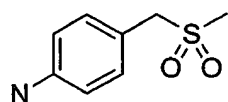
#### 5-amino-2-methyl-benzenesulfonamide



The title compound is described in the literature; CAS # 6973-09-7.

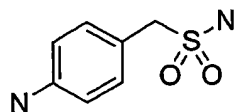
### Intermediate Example 18

#### 4-[(methylsulfonyl)methyl]aniline

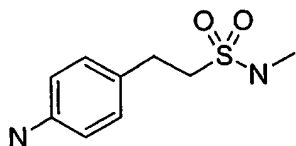


The title compound is described in the literature; CAS# 24176-70-3.

### Intermediate Example 19

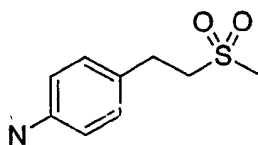
*(4-amino-phenyl)-methanesulfonamide*

The title compound is described in the literature: CAS # 4403-84-3.

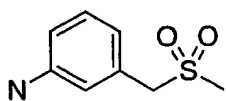
**Intermediate Example 20**5 *2-(4-amino-phenyl)-ethanesulfonic acid methylamide*

The title compound is described in the literature: CAS #

98623-16-6.

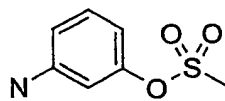
**Intermediate Example 21**10 *4-(2-Methanesulfonyl-ethyl)-phenylamine*

Synthesis of the title compound is described in International Patent Application PCT/US 03/03816 filed February 7, 2003.

**Intermediate Example 22**15 *3-Methanesulfonylmethyl-phenylamine*

The title compound is described in the literature: CAS #261925-02-

4.

**Intermediate Example 23**20 *Methanesulfonic acid 3-amino-phenylester*

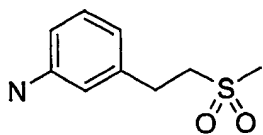
The title compound is described in the literature: CAS# 38164-50-

0.



### Intermediate Example 24

#### *3-(2-methanesulfonyl-ethyl)-phenylamine*

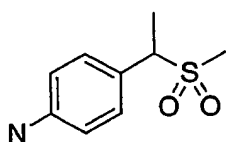


Synthesis of the title compound is described in International Patent Application PCT/US 03/03816 filed February 7, 2003.

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### Intermediate Example 25

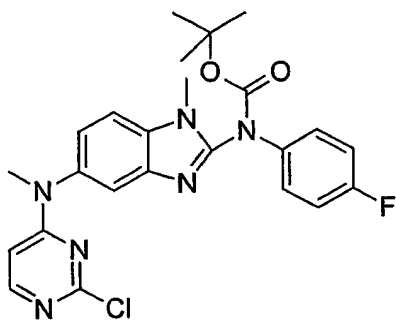
#### *4-(1-methanesulfonyl-ethyl)-phenylamine*



Synthesis of the title compound is described in International Patent Application PCT/US 03/03816 filed February 7, 2003.

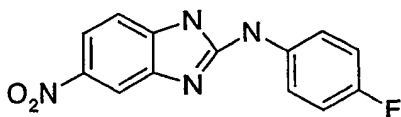
### 10 Intermediate Example 26

#### *{5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-(4-fluoro-phenyl)-carbamic acid tert-butyl ester*



15

#### *A. (4-Fluoro-phenyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine*

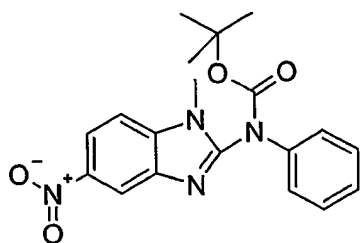


20

*N*<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12 mmol) and 4-fluorophenyl isothiocyanate (1.58 ml, 13.2 mmol) were coupled using the procedure of intermediate

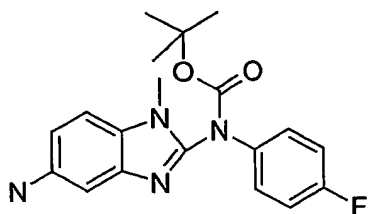
example four part A to give the title compound as a yellow solid (1.49 g, 43%).  $^1\text{H}$  NMR (300 MHz,  $\text{d}_6$ -DMSO)  $\delta$  9.29 (s, 1H), 8.17 (m, 1H), 8.01–8.04 (m, 1H), 7.89–7.90 (m, 2H), 7.49–7.52 (M, 1H), 7.18–7.25 (m, 2H), 3.79 (s, 3H).

5      B. (1-Methyl-5-nitro-1H-benzoimidazol-2-yl)-phenyl-carbamic acid tert-butyl ester



10      (4-Fluoro-phenyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine (1.49 g, 5.2 mmol) was protected following the procedure of intermediate example four part B to give the title compound as a light yellow solid (1.08 g, 54%).  $^1\text{H}$  NMR (300 MHz,  $\text{d}_6$ -DMSO)  $\delta$  8.50 (d,  $J$  = 2.1 Hz, 1H), 8.23 (dd,  $J$  = 9.0 and 2.1 Hz, 1H), 7.85 (d,  $J$  = 9.0 Hz, 1H), 7.47–7.51 (M, 2H), 7.22–7.27 (m, 2H), 3.84 (s, 3H), 1.40 (s, 9H).

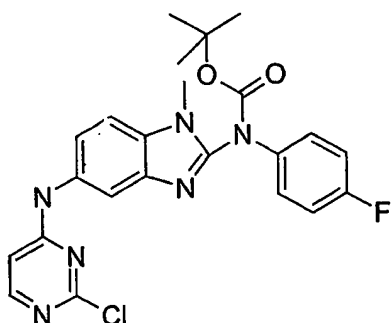
15      C. (5-Amino-1-methyl-1H-benzoimidazol-2-yl)-(4-fluoro-phenyl)-carbamic acid tert-butyl ester



20      (1-Methyl-5-nitro-1H-benzoimidazol-2-yl)-phenyl-carbamic acid tert-butyl ester (1.08 g, 2.8 mmol) was reduced by the procedure of intermediate example one part C to give the title compound as a white solid (0.99 g, 99%).  $^1\text{H}$  NMR (300 MHz,  $\text{d}_6$ -DMSO)  $\delta$  7.39–7.44 (M, 2H), 7.17–7.23 (M, 3H), 6.70 (d,  $J$  = 1.5 Hz, 1H), 6.63 (dd,  $J$  = 8.5 and 2.0 Hz, 1H), 4.78 (s, 2H), 3.61 (s, 3H).

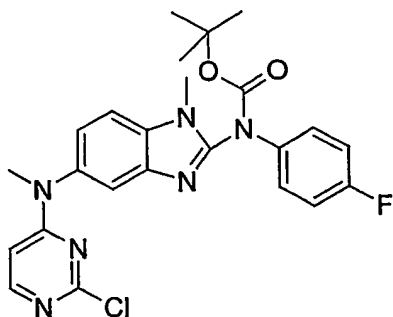
25

D. [5-(2-Chloro-pyrimidin-4-ylamino)-1-methyl-1H-benzoimidazol-2-yl]-(4-fluoro-phenyl)-carbamic acid tert-butyl ester



(5-Amino-1-methyl-1H-benzoimidazol-2-yl)-(4-fluoro-phenyl)-carbamic acid tert-butyl ester (0.99 g, 2.8 mmol) was coupled according to the procedure of intermediate example four part D to give the title compound as a white solid (1.00 g, 76%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.00 (s, 1H), 8.10 (d, J = 6.0 Hz, 1H), 7.89 (m, 1H), 7.58 (d, J = 8.4 Hz, 1H), 7.44–7.49 (m, 2H), 7.34 (d, J = 8.7 Hz, 1H), 7.20–7.26 (m, 2H), 6.69 (d, J = 6.0 Hz, 1H), 3.74 (s, 3H), 1.40 (s, 9H).

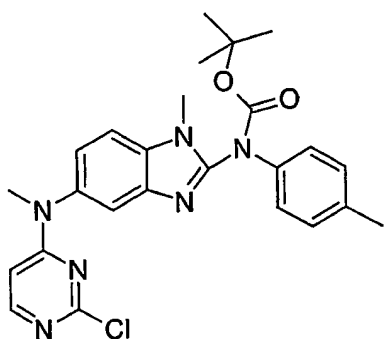
*E. {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-(4-fluoro-phenyl)-carbamic acid tert-butyl ester*



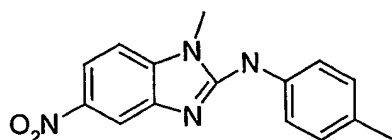
[5-(2-Chloro-pyrimidin-4-ylamino)-1-methyl-1H-benzoimidazol-2-yl]-(4-fluoro-phenyl)-carbamic acid tert-butyl ester was methylated according to the procedure of intermediate example four part E to give the title compound as an orange foam. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.91 (d, J = 6.0 Hz, 1H), 7.72 (d, J = 8.4 Hz, 1H), 7.61 (d, J = 1.5 Hz, 1H), 7.45–7.50 (M, 2H), 7.20–7.29 (M, 3H), 6.17 (d, J = 5.7 Hz, 1H), 3.79 (s, 3H), 3.41 (s, 3H), 1.42 (s, 9H). MS (ESI) m/z = 483 [M+H]<sup>+</sup>.

## Intermediate Example 27

*{5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-p-tolyl-carbamic acid tert-butyl ester*



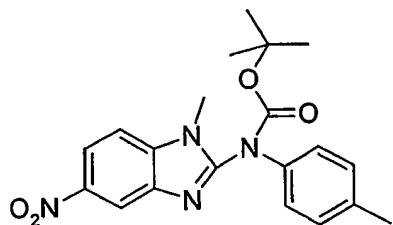
A. (1-Methyl-5-nitro-1H-benzoimidazol-2-yl)-p-tolyl-amine



5 N<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (2.5 g, 15 mmol) and *p*-tolyl isothiocyanate (2.46 g, 16.5 mmol) were coupled using the procedure of intermediate example four part A to give the title compound as a yellow solid (1.99 g, 47%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.14 (s, 1H), 8.15 (d, J = 2.1 Hz, 1H), 8.00 (dd, J = 8.7 and 2.1 Hz, 1H), 7.76 (d, J = 8.4 Hz, 2H), 7.47 (d, J = 8.7 Hz, 1H), 7.16 (d, J = 8.4 Hz, 2H), 3.77 (s, 3H), 2.28 (s, 3H).

10

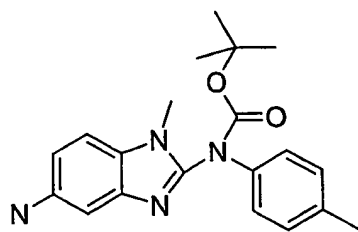
B. (1-Methyl-5-nitro-1H-benzoimidazol-2-yl)-p-tolyl-carbamic acid tert-butyl ester



15 (1-Methyl-5-nitro-1H-benzoimidazol-2-yl)-p-tolyl-amine (2.0 g, 7.1 mmol) was protected following the procedure of intermediate example four part B to give the title compound as a light yellow solid (1.50 g, 55%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 8.49 (d, J = 2.1 Hz, 1H), 8.22 (dd, J = 9.0 and 2.1 Hz, 1H), 7.83 (d, J = 9.3 Hz, 1H), 7.28 (d, J = 8.4 Hz, 2H), 7.20 (d, J = 8.1 Hz, 2H), 3.82 (s, 3H), 2.29 (s, 3H), 1.40 (s, 9H). MS (ESI) m/z = 405 [M+Na]<sup>+</sup>.

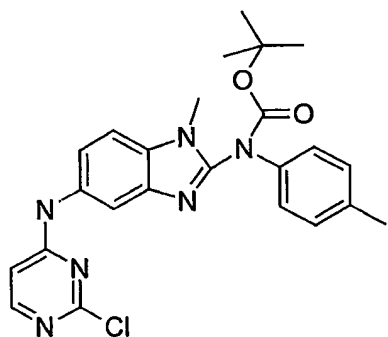
20

C. (5-Amino-1-methyl-1H-benzoimidazol-2-yl)-p-tolyl-carbamic acid tert-butyl ester



(1-Methyl-5-nitro-1H-benzoimidazol-2-yl)-p-tolyl-carbamic acid tert-butyl ester (1.50 g, 3.9 mmol) was reduced by the procedure of intermediate example one part C to give the title compound as a white solid (1.31 g, 96%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.14–7.23 (m, 5H), 6.69 (d, J = 1.5 Hz, 1H), 6.62 (dd, J = 8.5 and 1.9 Hz, 1H), 4.77 (s, 2H), 3.58 (s, 3H), 2.27 (s, 3H), 1.38 (s, 9H).

D. [5-(2-Chloro-pyrimidin-4-ylamino)-1-methyl-1H-benzoimidazol-2-yl]-p-tolyl-carbamic acid tert-butyl ester

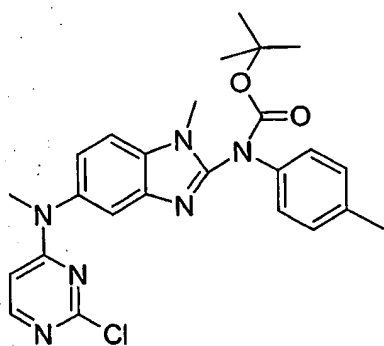


10

(5-Amino-1-methyl-1H-benzoimidazol-2-yl)-p-tolyl-carbamic acid tert-butyl ester (1.31 g, 3.7 mmol) was coupled according to the procedure of intermediate example four part D to give the title compound as a white solid (0.75 g, 44%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.00 (s, 1H), 8.10 (d, J = 6.0 Hz, 1H), 7.87 (s, 1H), 7.57 (d, J = 8.7 Hz, 1H), 7.34 (d, J = 8.7 Hz, 1H), 7.26 (d, J = 8.4 Hz, 2H), 7.18 (d, J = 8.4 Hz, 2H), 6.69 (d, J = 6.0 Hz, 1H), 3.72 (s, 3H), 2.28 (s, 3H), 1.40 (s, 9H). MS. (ESI) m/z = 465 [M+H]<sup>+</sup>.

15

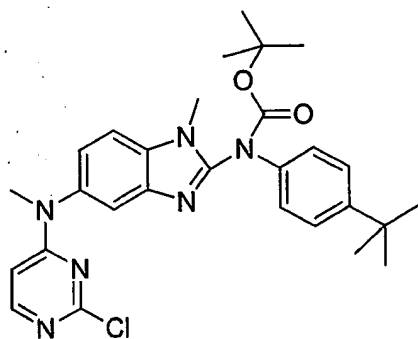
E. {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-p-tolyl-carbamic acid tert-butyl ester



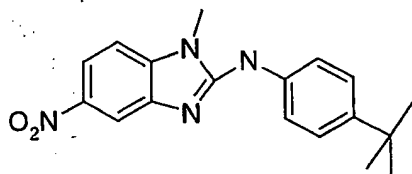
- 5 [5-(2-Chloro-pyrimidin-4-ylamino)-1-methyl-1H-benzoimidazol-2-yl]-p-tolyl-carbamic acid tert-butyl ester (0.75 g, 1.62 mmol) was methylated according to the procedure of intermediate example four part E to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.91 (d, J = 6.0 Hz, 1H), 7.71 (d, J = 8.4 Hz, 1H), 7.59 (d, J = 1.2 Hz, 1H), 7.27 (d, J = 8.4 Hz, 3H), 7.19 (d, J = 8.4 Hz, 2H), 6.17 (d, J = 5.4 Hz, 1H), 3.76 (s, 3H), 3.41 (s, 3H), 2.28 (s, 3H), 1.41 (s, 9H). MS (ESI) m/z = 479 [M+H]<sup>+</sup>.

#### Intermediate Example 28

- 10 (4-tert-Butyl-phenyl)-{5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester



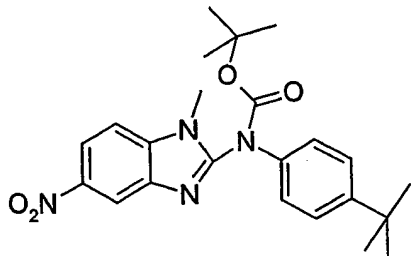
#### A. (4-tert-Butyl-phenyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine



- 15 N<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (1.89 g, 11.3 mmol) and *p*-tert-butylphenyl isothiocyanate (2.37 g, 12.4 mmol) were coupled using the procedure of intermediate example four part A to give the title compound as a yellow solid (1.39 g, 38%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.17 (s, 1H), 8.14 (d, J = 2.7 Hz, 1H), 8.00 (dd, J = 9.0 and

2.4 Hz, 1H), 7.76 (d,  $J = 8.7$  Hz, 2H), 7.48 (d,  $J = 9.0$  Hz, 1H), 7.37 (d,  $J = 8.7$  Hz, 2H), 3.78 (s, 3H), 1.29 (s, 9H).

B. (4-*tert*-Butyl-phenyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-carbamic acid *tert*-butyl ester

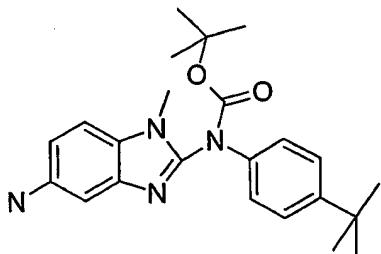


5

(4-*tert*-Butyl-phenyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine (1.38 g, 4.3 mmol) was protected following the procedure of intermediate example four part B to give the title compound as a light yellow solid (0.86 g, 47%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  8.49 (d,  $J = 2.1$  Hz, 1H), 8.23 (dd,  $J = 9.0$  and 2.1 Hz, 1H), 7.84 (d,  $J = 9.3$  Hz, 1H), 7.41 (d,  $J = 8.4$  Hz, 2H), 7.31 (d,  $J = 8.7$  Hz, 2H), 3.83 (s, 3H), 1.40 (s, 9H), 1.26 (s, 9H).

10

C. (5-Amino-1-methyl-1H-benzoimidazol-2-yl)-(4-*tert*-butyl-phenyl)-carbamic acid *tert*-butyl ester

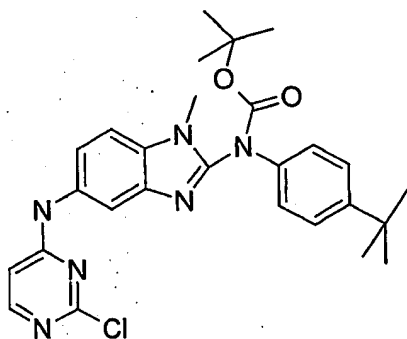


15

(4-*Tert*-Butyl-phenyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-carbamic acid *tert*-butyl ester (0.86 g, 2.1 mmol) was reduced by the procedure of intermediate example one part C to give the title compound as a white solid (0.81 g, 98%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  7.37 (d,  $J = 8.4$  Hz, 2H), 7.18–7.25 (m, 2H), 6.69 (d,  $J = 1.8$  Hz, 1H), 6.62 (dd,  $J = 8.7$  and 2.1 Hz, 1H), 4.78 (s, 2H), 3.60 (s, 3H), 1.38 (s, 9H), 1.25 (s, 9H).

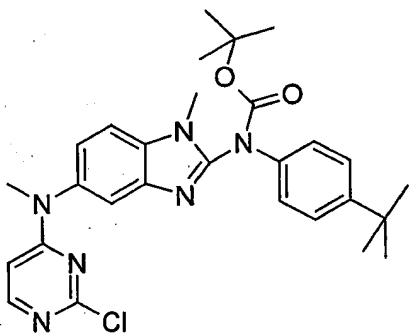
20

D. (4-*tert*-Butyl-phenyl)-[5-(2-chloro-pyrimidin-4-ylamino)-1-methyl-1H-benzoimidazol-2-yl]-carbamic acid *tert*-butyl ester



(5-Amino-1-methyl-1H-benzoimidazol-2-yl)-(4-tert-butyl-phenyl)-carbamic acid tert-butyl ester (0.81 g, 2.1 mmol) was coupled according to the procedure of intermediate example four part D to give the title compound as a white solid (0.76 g, 72%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.00 (s, 1H), 8.10 (d, J = 5.7 Hz, 1H), 7.88 (s, 1H), 7.57 (d, J = 8.7 Hz, 1H), 7.27-7.41 (m, 6H), 6.69 (d, J = 6.0 Hz, 1H), 3.73 (s, 3H), 1.40 (s, 9H), 1.26 (s, 9H).

E. (4-tert-Butyl-phenyl)-{5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester

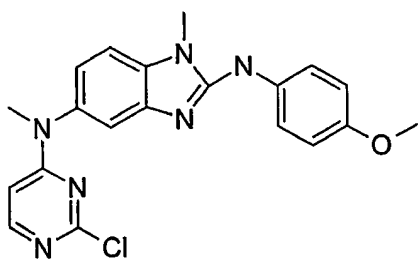


(4-tert-Butyl-phenyl)-[5-(2-chloro-pyrimidin-4-ylamino)-1-methyl-1H-benzoimidazol-2-yl]-carbamic acid tert-butyl ester (0.76 g, 1.50 mmol) was methylated according to the procedure of intermediate example four part E to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.90 (d, J = 6.0 Hz, 1H), 7.72 (d, J = 8.7 Hz, 1H), 7.60 (d, J = 1.5 Hz, 1H), 7.40 (d, J = 8.7 Hz, 2H), 7.25-7.31 (m, 3H), 7.16 (d, J = 5.7 Hz, 1H), 3.78 (s, 3H), 3.41 (s, 3H), 1.41 (s, 9H), 1.26 (s, 9H). MS (ESI) m/z = 521 [M+H]<sup>+</sup>.

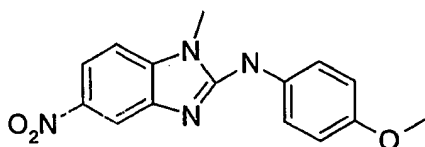
## Intermediate Example 29

*N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(4-methoxy-phenyl)-1,*N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine



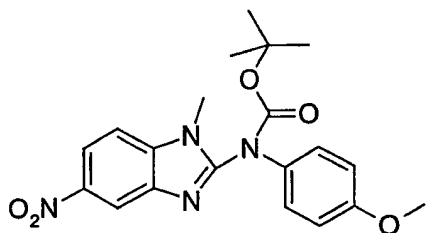


A. (4-Methoxy-phenyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine



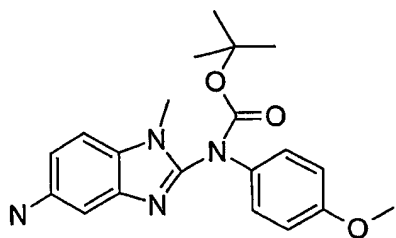
N<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (2.0, 12.0 mmol) and *p*-methoxyphenyl isothiocyanate (1.82 ml, 13.2 mmol) were coupled using the procedure of intermediate example four part A to give the title compound as a yellow solid (1.88 g, 53%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.08 (s, 1H), 8.12 (d, J = 2.1 Hz, 1H), 7.99 (dd, J = 8.7 and 2.1 Hz, 1H), 7.76 (d, J = 9.0 Hz, 2H), 7.46 (d, J = 9.0 Hz, 1H), 6.95 (d, J = 9.0 Hz, 2H), 3.76 (s, 3H), 3.75 (s, 3H). MS (ESI) m/z = 299 [M+H]<sup>+</sup>.

B. (4-Methoxy-phenyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-carbamic acid tert-butyl ester



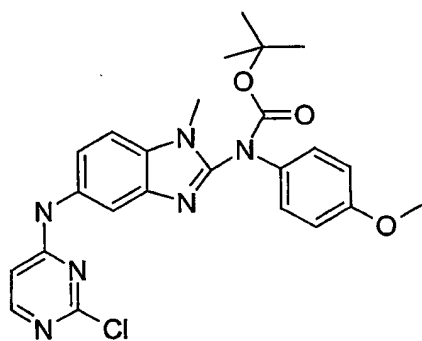
(4-Methoxy-phenyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine (1.88 g, 6.3 mmol) was protected following the procedure of intermediate example four part B to give the title compound as a light yellow solid (1.09 g, 43%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 8.48 (d, J = 2.1 Hz, 1H), 8.22 (dd, J = 9.0 and 2.1 Hz, 1H), 7.82 (d, J = 9.0 Hz, 1H), 7.35 (d, J = 9.0 Hz, 2H), 6.94 (d, J = 8.7 Hz, 2H), 3.83 (s, 3H), 3.74 (s, 3H), 1.40 (s, 9H). MS (ESI) m/z = 399 [M+H]<sup>+</sup>.

C. (5-Amino-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester



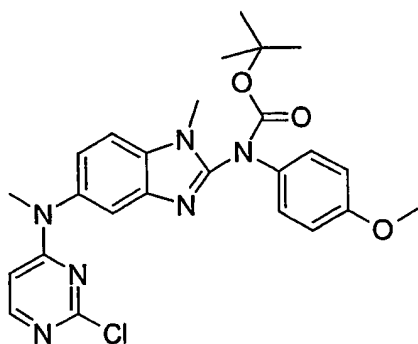
(4-Methoxy-phenyl)-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-carbamic acid tert-butyl ester (1.09 g, 2.7 mmol) was reduced by the procedure of intermediate example one part C to give the title compound as a white solid (1.05 g, 98%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.28 (d, J = 8.7 Hz, 2H), 7.18 (d, J = 8.4 Hz, 1H), 6.91 (d, J = 9.0 Hz, 2H), 6.68 (d, J = 1.5 Hz, 1H), 6.61 (dd, J = 8.4 and 1.5 Hz, 1H), 4.76 (s, 2H), 3.73 (s, 3H), 3.60 (s, 3H), 1.38 (s, 9H).

10 D. [5-(2-Chloro-pyrimidin-4-ylamino)-1-methyl-1H-benzoimidazol-2-yl]-(4-methoxy-phenyl)-carbamic acid tert-butyl ester



15 (5-Amino-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester (1.05 g, 2.85 mmol) was coupled according to the procedure of intermediate example four part D to give the title compound as a white solid (0.96 g, 70%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.99 (s, 1H), 8.09 (d, J = 6.0 Hz, 1H), 7.87 (br s, 1H), 7.56 (d, J = 8.7 Hz, 1H), 7.33 (d, J = 9.0 Hz, 2H), 6.93 (d, J = 9.0 Hz, 2H), 6.69 (d, J = 6.0 Hz, 1H), 3.74 (s, 3H), 3.73 (s, 3H), 1.39 (s, 9H). MS (ESI) m/z = 481 [M+H]<sup>+</sup>.

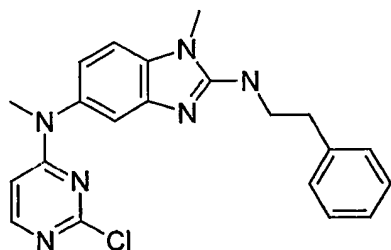
20 E. {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-(4-methoxy-phenyl)-carbamic acid tert-butyl ester



- 5 [5-(2-Chloro-pyrimidin-4-ylamino)-1-methyl-1H-benzoimidazol-2-yl]-(4-methoxyphenyl)-carbamic acid tert-butyl ester was methylated according to the procedure of intermediate example four part E to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.90 (d, J = 6.0 Hz, 1H), 7.70 (d, J = 8.4 Hz, 1H), 7.59 (d, J = 1.8 Hz, 1H), 7.34 (d, J = 9.0 Hz, 2H), 7.26 (dd, J = 8.5 and 1.9 Hz, 1H), 6.93 (d, J = 9.0 Hz, 2H), 6.16 (d, J = 5.4 Hz, 1H), 3.78 (s, 3H), 3.74 (s, 3H), 3.41 (s, 3H), 1.41 (s, 9H). MS (ESI) m/z = 495 [M+H]<sup>+</sup>.

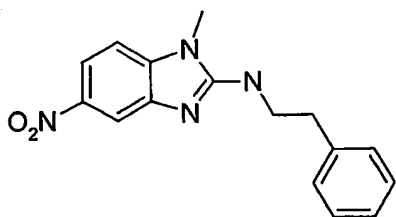
#### 10 Intermediate Example 30

*N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-phenethyl-1H-benzoimidazole-2,5-diamine



15

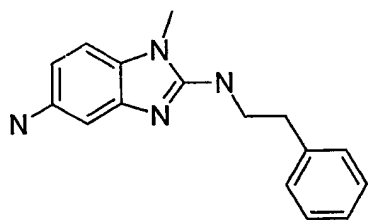
#### A. (1-Methyl-5-nitro-1H-benzoimidazol-2-yl)-phenethyl-amine



*N*<sup>1</sup>-methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12.0 mmol) and phenethyl isothiocyanate (2.15 g, 13.2 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (2.36 g, 66%). <sup>1</sup>H NMR

(300 MHz,  $d_6$ -DMSO)  $\delta$  8.01 (d,  $J$  = 2.1 Hz, 1H), 7.90 (dd,  $J$  = 8.7 and 2.4 Hz, 1H), 7.21–7.35 (m, 7 H), 3.58–3.65 (m, 2H), 3.56 (s, 3H), 2.93–2.98 (m, 2H) ppm.

B. 1-Methyl- $N^2$ -phenethyl-1H-benzoimidazole-2,5-diamine

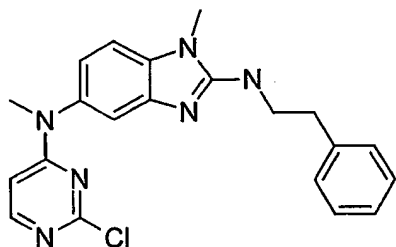


5

(1-Methyl-5-nitro-1H-benzoimidazol-2-yl)-phenethyl-amine (2.36 g, 8 mmol) was reduced using the procedure of intermediate example one part C to give the title compound as a white solid (1.98 g, 93%).  $^1\text{H}$  NMR (300 MHz,  $\text{CD}_3\text{OD}$ )  $\delta$

10

C.  $N^5$ -(2-Chloro-pyrimidin-4-yl)-1, $N^5$ -dimethyl- $N^2$ -phenethyl-1H-benzoimidazole-2,5-diamine

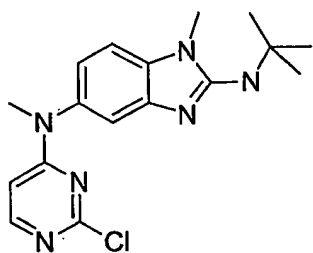


$N^2$ ,1-Dimethyl-1H-benzimidazole-2,5-diamine was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a white solid (1.43 g, 49 % over 2 steps).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  7.87 (d,  $J$  = 6.0 Hz, 1H), 7.20–7.34 (m, 6H), 7.15 (d,  $J$  = 2.1 Hz, 1H), 6.97 (t,  $J$  = 5.4 Hz, 1H), 6.84 (dd,  $J$  = 8.4 and 1.8 Hz, 1H), 6.10 (d,  $J$  = 5.7 Hz, 1H), 3.54–3.61 (m, 2H), 3.50 (s, 3H), 3.38 (s, 3H), 2.92–2.97 (m, 2H) ppm. MS (ESI)  $m/z$  = 393  $[\text{M}+\text{H}]^+$ .

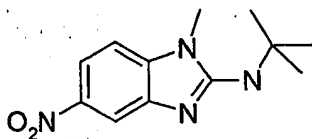
15

20 Intermediate Example 31

$N^2$ -Tert-Butyl- $N^5$ -(2-chloro-pyrimidin-4-yl)-1, $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine

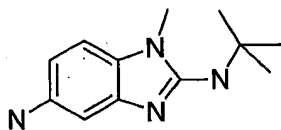


A. *Tert-Butyl-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine*



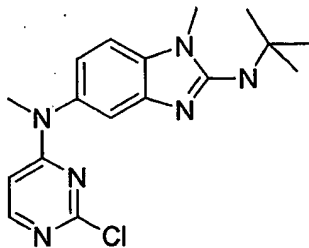
5 *N'*-methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12.0 mmol) and tert-butyl isothiocyanate (1.67 ml, 13.2 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 8.01 (d, J = 2.1 Hz, 1H), 7.90 (dd, J = 8.7 and 2.1 Hz, 1H), 7.32 (d, J = 8.7 Hz, 1H), 6.41 (s, 1H), 3.58 (s, 3H), 1.48 (s, 9H) ppm.

10 B. *N<sup>2</sup>-Tert-Butyl-1-methyl-1H-benzoimidazole-2,5-diamine*



*Tert-Butyl-(1-methyl-5-nitro-1H-benzoimidazol-2-yl)-amine* (700 mg, 2.8 mmol) was reduced using the procedure of intermediate example one part C to give the title compound as a brown solid (240 mg, 39%). <sup>1</sup>H NMR (300 MHz, CD<sub>3</sub>OD) δ 6.76 (d, J = 8.1 Hz, 1H), 6.48 (d, J = 1.8 Hz, 1H), 6.22 (dd, J = 8.1 and 1.8 Hz, 1H), 5.64 (s, 1H), 4.40 (br s, 2H), 3.36 (s, 3H), 1.43 (s, 9H) ppm.

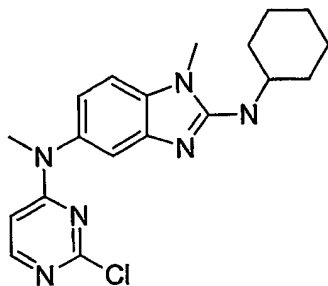
C. *N<sup>2</sup>-Tert-Butyl-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine*



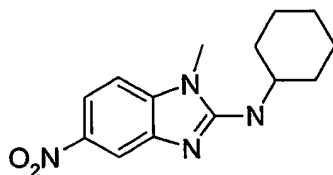
20 *N<sup>2</sup>-Tert-Butyl-1-methyl-1H-benzoimidazole-2,5-diamine* (240 mg, 1.1 mmol) was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a white solid (348 mg, 92 % over 2 steps). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.86 (d, J = 6.0 Hz, 1H), 7.23 (d, J = 8.4 Hz, 1H), 7.16 (d, J = 1.8 Hz, 1H), 6.84 (dd, J = 8.1 and 1.8 Hz, 1H), 6.08 (br s, 2H), 3.52 (s, 3H), 3.38 (s, 3H), 1.46 (s, 9H) ppm. MS (ESI) m/z = 345 [M+H]<sup>+</sup>.

**Intermediate Example 32**

*N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-cyclohexyl-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine

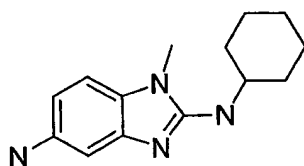


5

**A. Cyclohexyl-(1-methyl-5-nitro-1*H*-benzoimidazol-2-yl)-amine**

*N*<sup>1</sup>-methyl-4-nitro-benzene-1,2-diamine (2.0 g, 12.0 mmol) and cyclohexyl isothiocyanate (1.80 ml, 13.2 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (2.41 g, 73%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.98 (d, *J* = 2.4 Hz, 1H), 7.88 (dd, *J* = 8.7 and 2.4 Hz, 1H), 7.30 (d, *J* = 8.7 Hz, 1H), 6.88 (d, *J* = 7.8 Hz, 1H), 3.74 (m, 1H), 3.56 (s, 3H), 2.00 (M, 2H), 1.75 (m, 2H), 1.63 (m, 1H), 1.25-1.36 (M, 4H), 1.17 (M, 1H) ppm.

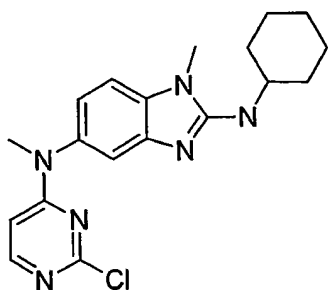
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**B. *N*<sup>2</sup>-Cyclohexyl-1-methyl-1*H*-benzoimidazole-2,5-diamine**

Cyclohexyl-(1-methyl-5-nitro-1*H*-benzoimidazol-2-yl)-amine (2.4 g, 8.8 mmol) was reduced using the procedure of intermediate example one part C to give the title compound as a white solid (2.05 g, 95%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 6.74 (d, *J* = 8.1 Hz, 1H), 6.44 (d, *J* = 1.8 Hz, 1H), 6.20 (dd, *J* = 8.2 and 2.0 Hz, 1H), 6.05 (d, *J* = 7.5 Hz, 1H), 4.32 (br s, 2H), 3.62 (m, 1H), 3.35 (s, 3H), 1.96-1.99 (m, 2H), 1.71-1.75 (m, 2H), 1.60-1.67 (m, 1H), 1.03-1.34 (m, 5H) ppm. MS (ESI) *m/z* = 245 [M+H]<sup>+</sup>.

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**C. *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-cyclohexyl-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine**



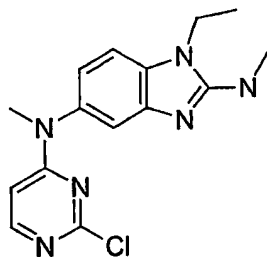
*N*<sup>2</sup>-Cyclohexyl-1-methyl-1H-benzoimidazole-2,5-diamine (2.03 g, 8.3 mmol)

was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a white solid (2.45 g, 80 % over 2 steps). <sup>1</sup>H NMR

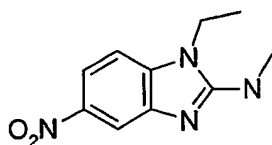
(300 MHz, d<sub>6</sub>-DMSO) δ 7.87 (d, J = 6.3 Hz, 1H), 7.21 (d, J = 8.4 Hz, 1H), 7.11 (d, J = 1.8 Hz, 1H), 6.82 (dd, J = 8.2 and 2.0 Hz, 1H), 6.52 (d, J = 7.8 Hz, 1H), 6.09 (d, J = 5.7 Hz, 1H), 3.70 (m, 1H), 3.51 (s, 3H), 3.37 (s, 3H), 1.99 (m, 2H), 1.74 (m, 2H), 1.62 (m, 1H), 1.14–1.31 (m, 5H) ppm. MS (ESI) m/z = 371 [M+H]<sup>+</sup>.

#### 10 Intermediate Example 33

*N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1-ethyl-*N*<sup>2</sup>,*N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine



A. (1-Ethyl-5-nitro-1H-benzoimidazol-2-yl)-methyl-amine



15

*N*-Ethyl-4-nitro-benzene-1,2-diamine (2.0 g, 11.0 mmol) and methyl

isothiocyanate (0.83 ml, 12.1 mmol) were coupled using the procedure of intermediate example one part B to give the title compound as a yellow solid (0.99 g, 41%). <sup>1</sup>H

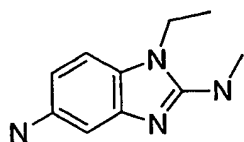
NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.99 (d, J = 2.4 Hz, 1H), 7.90 (dd, J = 8.7 and 2.1 Hz, 1H),

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7.36 (d, J = 8.7 Hz, 1H), 7.16 (m, 1H), 4.08 (q, J = 7.2 Hz, 2H), 2.96 (d, J = 4.5 Hz, 3H),

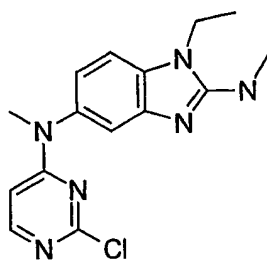
1.21 (t, J = 7.2 Hz, 3H). MS (ESI) m/z = 221 [M+H]<sup>+</sup>.

B. 1-Ethyl-*N*<sup>2</sup>-methyl-1H-benzoimidazole-2,5-diamine



(1-Ethyl-5-nitro-1H-benzoimidazol-2-yl)-methyl-amine (0.99 g, 4.5 mmol) was reduced by the procedure of intermediate example one part C to give the title compound as a white solid (0.95 g, >95%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 6.78 (d, J = 8.4 Hz, 1H), 6.47 (d, J = 1.8 Hz, 1H), 6.32 (br s, 1H), 6.21 (dd, J = 8.4 and 1.8 Hz, 1H), 4.15 (br s, 2H), 3.85 (q, J = 7.1 Hz, 2H), 2.86 (s, 3H), 1.13 (t, J = 7.1 Hz, 3H). MS (ESI) m/z = 191 [M+H]<sup>+</sup>.

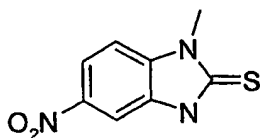
10 *C. N<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1-ethyl-N<sup>2</sup>,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine*



1-Ethyl-N<sup>2</sup>-methyl-1H-benzoimidazole-2,5-diamine (0.95 g, 4.9 mmol) was coupled and methylated according to the procedure of intermediate example one part D to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 7.88 (d, J = 6.0 Hz, 1H), 7.26 (d, J = 8.1 Hz, 1H), 7.13 (d, J = 10.8 Hz, 1H), 6.78-6.85 (m, 2H), 6.11 (d, J = 5.7 Hz, 1H), 4.02 (q, J = 7.1 Hz, 2H), 3.38 (s, 3H), 2.92 (d, J = 4.5 Hz, 3H), 1.21 (t, J = 7.1 Hz, 3H). MS (ESI) m/z = 317 [M+H]<sup>+</sup>.

**Intermediate Example 34**

20 *1-Methyl-5-nitro-1,3-dihydro-benzoimidazole-2-thione*



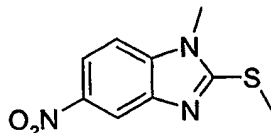
A solution of thiophosgene (2.3 ml, 30 mmol) in THF(300ml) was added dropwise to a solution containing N<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (5.01g, 30mmol) and Et<sub>3</sub>N (9.2ml, 66mmol) in THF(300ml) at 0°C over 90 min. After stirring at 0°C for another 1hr, the mixture was allowed to warm to room temperature. The mixture was then concentrated to



about 100ml, water(200ml) was added, the mix was stirred for 20 min, the product was collected by filtration and washed with small amount of cold  $\text{CH}_2\text{Cl}_2$ , after drying left 5.16g as a mustard yellow solid: LC/MS(m/e) at 210.0[M+H]<sup>+</sup>, Rt at 1.49 min.

### 5 Intermediate Example 35

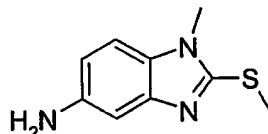
*1-Methyl-2-methylsulfanyl-5-nitro-1H-benzoimidazole*



A mixture of 1-Methyl-5-nitro-1,3-dihydro-benzoimidazole-2-thione (5.16g, 24.7mmol),  $\text{Na}_2\text{CO}_3$  (2.88g, 27.2 mmol) and MeI (3.68g, 25.94mmol) in acetone(150ml) was refluxed overnight. The mix was filtered hot and the filtrate was concentrated to about 50ml, the product was collected by filtration and washed with a small amount of cold  $\text{CH}_2\text{Cl}_2$ , drying left 4.58g as a mustard yellow solid: LC/MS(m/e) at 224.0[M+H]<sup>+</sup>, Rt at 1.55 min.

### 15 Intermediate Example 36

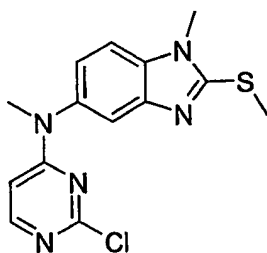
*1-Methyl-2-methylsulfanyl-1H-benzoimidazol-5-ylamine:*



Zinc (9.52g, 145.6 mmol) was added to a mix of 1-Methyl-2-methylsulfanyl-5-nitro-1H-benzoimidazole (4.64g, 20.8mmol) in EtOH(100ml) and glacial acetic acid (200 ml), the resulting mix was stirred at room temperature for 2 hr. and filtered, the filtrate was concentrated, the residual was taken into water(100 ml) and neutralized by NaOH and the product was extracted by  $\text{CH}_2\text{Cl}_2$  until all product was extracted from aqueous. The combined extracts were washed with brine, drying and concentrated gave 3.86g as dust pink solid: LC/MS(m/e) at 194.0[M+H]<sup>+</sup>, Rt at 1.02 min.

### 25 Intermediate Example 37

*(2-Chloro-pyrimidin-4-yl)-methyl-(1-methyl-2-methylsulfanyl-1H-benzoimidazol-5-yl)-amine*

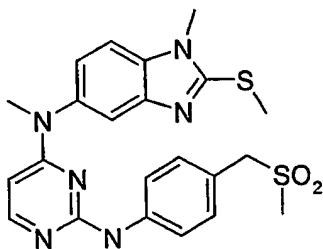


Follow the procedure of Intermediate Example 1D, replacing *N*<sup>2</sup>-isopropyl-1-methyl-1*H*-benzimidazole-2,5-diamine by 1-Methyl-2-methylsulfonyl-1*H*-benzimidazol-5-ylamine gave the title compound as a white solid: LC/MS(*m/e*) at 320.0[*M*+*H*]<sup>+</sup>, *R*<sub>t</sub> at 1.53 min.

5

### Intermediate Example 38

*N*<sup>2</sup>-(4-Methanesulfonylmethyl-phenyl)-*N*<sup>4</sup>-methyl-*N*<sup>4</sup>-(1-methyl-2-methylsulfonyl-1*H*-benzimidazol-5-yl)-pyrimidine-2,4-diamine

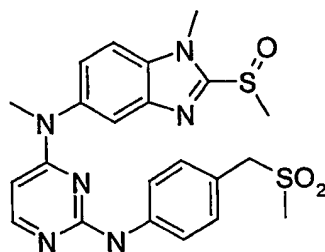


10

A mixture of (2-Chloro-pyrimidin-4-yl)-methyl-(1-methyl-2-methylsulfonyl-1*H*-benzimidazol-5-yl)-amine (3.19g, 10mmol), 4-Methanesulfonylmethyl-phenylamine (1.85g, 10mmol) and (833ul, 12N, 10mmol) was refluxed in isopropanol(100ml) overnight. The mixture was then concentrated to dryness and the residual was taken into MeOH and stirred with NaHCO<sub>3</sub> (3g) at room temperature for 20 min. and filtered, the filtrate was concentrated and the residual was purified by silica flash gave 3.35g as a pale yellow solid: LC/MS(*m/e*) 469.2[*M*+*H*]<sup>+</sup>, *R*<sub>t</sub> at 1.37 min.

### 20 Intermediate Example 39

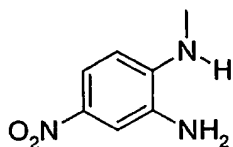
*N*<sup>4</sup>-(2-Methanesulfonyl-1-methyl-1*H*-benzimidazol-5-yl)-*N*<sup>2</sup>-(4-methanesulfonylmethyl-phenyl)-*N*<sup>4</sup>-methyl-pyrimidine-2,4-diamine



mCPBA(1.27 g, 5.61 mmol) was added to a solution of N<sup>2</sup>-(4-methanesulfonylmethyl-phenyl)-N<sup>4</sup>-methyl-N<sup>4</sup>-(1-methyl-2-methylsulfanyl-1H-benzimidazol-5-yl)-pyrimidine-2,4-diamine (2.4g, 5.1 mmol) in CHCl<sub>3</sub> (60 ml) at -20°C. The resulting mixture was stirred at -20°C for 6hr and diluted by CHCl<sub>3</sub>, washed with NaHCO<sub>3</sub> (10%, x 4), all extracts were combined and washed by brine, drying and concentrated, the residual was purified by silica flash gave 1.22g as a light yellow solid: LC/MS(m/e) 485[M+H]<sup>+</sup>, Rt at 1.29 min.

#### 10 Intermediate Example 40

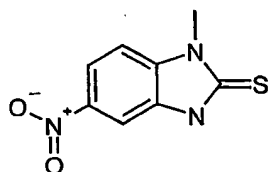
*N*<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine



To a solution of 2-fluoro-5-nitroaniline (3.0 g, 19.2 mmol) in 24 ml *N*-methylpyrrolidinone in a sealed reaction vessel was added potassium carbonate (5.4g, 30.0 mmol) and a solution of methyl amine (20 ml, 2M in THF) and the reaction was heated to 120 °C. After 16 h, the reaction mixture was cooled to room temperature and poured into 200 ml of water. The resulting precipitate was filtered and dried to give the title compound as a red solid. MS (ESI) m/z = 168 [M+H].

#### Intermediate Example 41

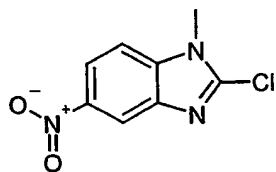
*1*-Methyl-5-nitro-1,3-dihydro-benzimidazole-2-thione



To a solution of *N*<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (1.0 g, 6.0 mmol) and triethylamine 2.5 ml (18 mmol) in THF (60 ml) was added thiophosgene (0.46 ml, 6.0 mmol) at 0 °C. After 1 h, the reaction mixture was warmed up to rt and was stirred at room temperature for 3 h. After the starting material was consumed, the reaction was  
 5 filtered. The collected solid was washed with EtOAc : Hexane = 1:1 (10 ml x 2) and water. The resulting yellow solid was dried to give the title compound (0.82 g, 66%). MS (ESI) *m/z* = 209 [M+H].

#### Intermediate Example 42

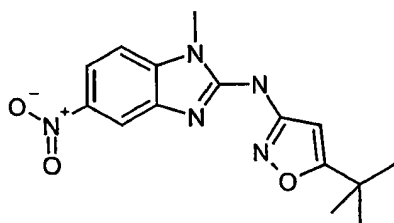
10 *2-Chloro-1-methyl-5-nitro-1 H -benzoimidazole*



The compound 1-Methyl-5-nitro-1,3-dihydro-benzoimidazole-2-thione (5.8 g, 27.9 mmol) was heated to reflux with SOCl<sub>2</sub> (30 ml) overnight. The reaction mixture was cooled to room temperature and poured into 300 ml of ice water and extracted  
 15 with CH<sub>2</sub>Cl<sub>2</sub>. The organic layers was washed with 10% NaHCO<sub>3</sub> water solution, brine, dried over Na<sub>2</sub>SO<sub>4</sub> and concentrated to give the title compound as a yellow solid. MS (ESI) *m/z* = 212 [M+H].

#### Intermediate Example 43

20 *(5-tert-Butyl-isoxazol-3-yl)-(1-methyl-5-nitro-1-H-benzoimidazol-2-yl)-amine*



To a solution of 2-Chloro-1-methyl-5-nitro-1 *H* -benzoimidazole (200 mg, 0.19 mmol) and 5-tert-Butyl-isoxazol-3-ylamine (265 mg, 1.90 mmol) in isopropanol  
 25 (15 ml) was added a solution of HCl (3 drops, 4.0m in dioxane). The reaction was heated to 80 °C. and after 20 h. the reaction mixture was cooled to rt. The solvent was

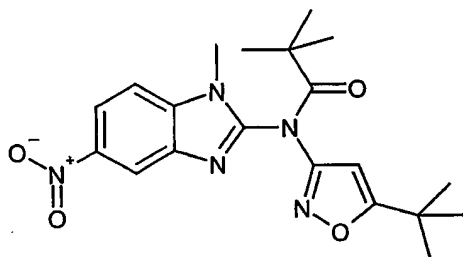
evaporated to dryness and the resultant solid was dissolved in EtOAc and neutralized by a 10% NaHCO<sub>3</sub> water solution. The combined organic layers were washed with water, dried over MgSO<sub>4</sub> and concentrated to give a foam. The crude material was purified through silica gel to give the title compound as a yellow solid (190 mg, 63%).

5 MS (ESI)  $m/z$  = 316 [M+H].

#### Intermediate Example 44

N-(5-tert-Butyl-isoxazol-3-yl)-2,2-dimethyl-N-(1-methyl-5-nitro-1-H-benzoimidazol-2-yl)-propinamide

10

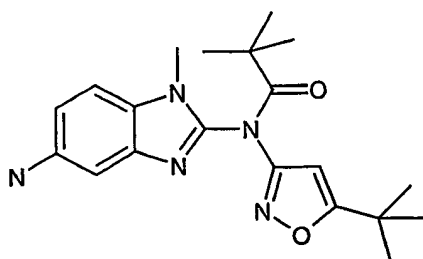


To a solution of (1.97 g, 7.4 mmol) (5-tert-Butyl-isoxazol-3-yl)-(1-methyl-5-nitro-1-H-benzoimidazol-2-yl)-amine (439 mmol, 1.38 mmol) in THF (30 ml) was added cesium carbonate (906 mg, 2.78 mmol) and di-tert-butyl dicarbonate THF solution (2.1 ml, 2.09 mmol 1M THF solution). The reaction was stirred at rt for 16h and then the reaction was diluted with water and extracted with EtOAc. The combined organic layers were washed with water, dried over MgSO<sub>4</sub> and concentrated to afford a yellow oil. The crude material was purified through silica gel to give the title compound as a yellow solid (190 mg, 33%). MS (ESI)  $m/z$  = 416 [M+H].

20

#### Intermediate Example 45

N-(5-Amino-1-methyl-1-H-benzoimidazol-2-yl)-N-(5-tert-Butyl-isoxazol-3-yl)-2,2-dimethyl-propinamide

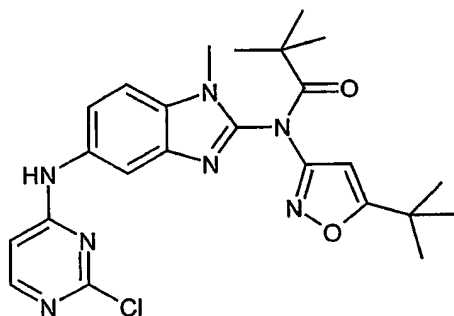


25

To a solution of *N*-(5-*tert*-butyl-isoxazol-3-yl)-2,2-dimethyl-*N*-(1-methyl-5-nitro-1-*H*-benzoimidazol-2-yl)-propionamide (190 mg, 0.48 mmol) in acetic acid (12 ml and ethanol 3 ml) was added zinc powder (290mg). The reaction mixture was stirred at room temperature until the starting material was consumed, and then the reaction was filtered. The solvent was evaporated to give a brown residue that was then dissolved in CH<sub>2</sub>Cl<sub>2</sub> and washed with a 10% NaHCO<sub>3</sub> water solution and brine. The organic layers was dried over MgSO<sub>4</sub> and concentrated to title compound as a yellow solid (140 mg, 73%). MS (ESI) *m/z* = 450 [M+H].

#### 10 Intermediate Example 46

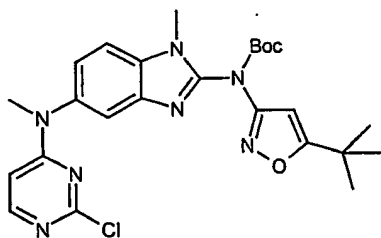
*N*-(5-*tert*-butyl-isoxazol-3-yl)-2,2-dimethyl-*N*-[1-methyl-5-(2-methyl-pyrimidin-4-ylamino)-1*H*-benzoimidazol-2-yl]-propionamide



To a solution of *N*-(5-amino-1-methyl-1-*H*-benzoimidazol-2-yl)-*N*-(5-*tert*-butyl-isoxazol-3-yl)-2,2-dimethyl-propionamide (149 mg, 0.39 mmol) in THF (3 ml) and ethanol (9 ml) was added NaHCO<sub>3</sub> (66 mg, 0.78 mmol) and 2,4-dichloropyrimidine (78 mg, 0.52 mmol) and the reaction was heated to 75 °C. After 5 h, the reaction was filtered hot and concentrated to give a brown residue. The crude material was diluted with ether and the title compound was precipitated out by the addition of hexane (140 mg, 73%). MS (ESI) *m/z* = 498 [M+H].

#### Intermediate Example 47

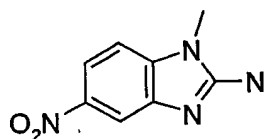
*N*-(5-*tert*-butyl-isoxazol-3-yl)-*N*-{5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1*H*benzoimidazole-2-yl}-2,2-dimethyl propionamide



*N*-(5-tert-Butyl-isoxazol-3-yl)-2,2-dimethyl-*N*-[1-methyl-5-(2-methyl-pyrimidin-4-ylamino)-1*H*-benzimidazol-2-yl]-propionamide (200 mg, 0.37 mmol) was dissolved in DMF (10 ml) and cesium carbonate (244 mg, 0.75 mmol) was added. After 15 min, iodomethane (25  $\mu$ l, 0.41 mmol) was added, and the reaction was stirred at rt. until the starting material was consumed. The reaction was diluted with water and the aqueous layer was extracted with EtOAc. The combined organic layers were washed with water, dried over Na<sub>2</sub>SO<sub>4</sub> and concentrated to afford a white solid (195 mg 96%). MS (ESI)  $m/z$  = 512 [M+H]<sup>+</sup>.

#### 10 Intermediate Example 48

*1-methyl-5-nitro-1H-benzimidazol-2-amine*

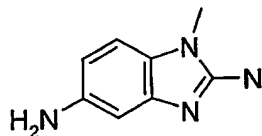


To a solution of *N*<sup>1</sup>-methyl-4-nitro-benzene-1,2-diamine (200 mg, 1.20 mmol) in methanol (12 ml) was added cyanogen bromide (190.1 mg, 1.79 mmol). After stirring at room temperature for 16 h, the methanol was removed in vacuo and the resulting solid was stirred with diethyl ether (40 ml) for 5 minutes. The resulting hydrobromide salt of the title compound was filtered and air-dried.

<sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO)  $\delta$  7.91 (s, 1H), 7.88 (d,  $J$ =8.6 Hz, 1H), 7.31 (d,  $J$ =8.5 Hz, 1H), 6.96 (s, 2H), 3.57 (s, 3H).

#### Intermediate Example 49

*1-methyl-1H-benzimidazole-2,5-diamine*

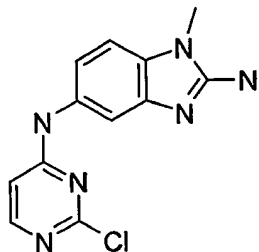


The title compound was prepared utilizing the procedure of Intermediate Example 1C, except that 1-methyl-5-nitro-1*H*-benzimidazol-2-amine was used as a starting material.

<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 6.72 (d, *J*=8.6 Hz, 1H), 6.37 (s, 1H), 6.17 (d, *J*=8.1 Hz, 1H), 6.04 (m, 2H), 4.36 (br s, 2H), 3.34 (s, 3H).

### Intermediate Example 50

#### 5 *N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-1-methyl-1H-benzimidazole-2,5-diamine

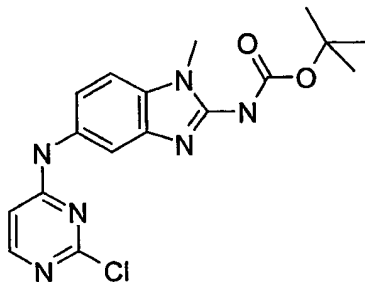


The title compound was prepared utilizing the procedure of Intermediate Example 1D, except that 1-methyl-1H-benzimidazole-2,5-diamine was used a starting material.

10 <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.75 (s, 1H), 8.02 (d, *J*=5.9 Hz, 1H), 7.29 (br s, 1H), 7.09 (d, *J*=8.3 Hz, 1H), 6.93 (br m, 1H), 6.58 (d, *J*=5.2 Hz, 1H), 6.44 (s, 2H), 3.47 (s, 3H).

### Intermediate Example 51

#### 15 *tert*-butyl 5-[(2-chloropyrimidin-4-yl)amino]-1-methyl-1H-benzimidazol-2-ylcarbamate



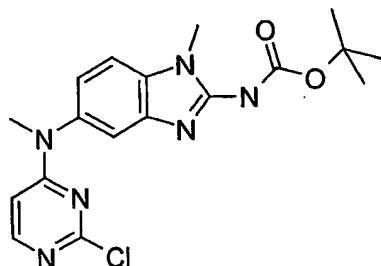
To a solution of *N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-1-methyl-1H-benzimidazole-2,5-diamine (200 mg, 0.728 mmol) in THF (10 ml), was added triethylamine (0.101 ml, 0.728 mmol) and di-*tert*-butyl dicarbonate (175 mg, 0.801 mmol). After stirring 16 h at roomtemperature, the reaction was diluted with water and extracted with EtOAc. The combined organic layers were washed with water, dried over MgSO<sub>4</sub> and concentrated in vacuo. <sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 9.92 (s, 1H), 8.09 (d, *J*=5.8 Hz, 1H), 7.74 (br s, 1H), 7.21-7.19 (m, 2H), 7.02 (d, *J*=8.2 Hz, 1H), 6.66 (d, *J*=5.9 Hz, 1H), 3.24 (s, 3H), 1.61 (s, 9H).



## Intermediate Example 52

*tert*-butyl 5-[(2-chloropyrimidin-4-yl)(methyl)amino]-1-methyl-1H-benzimidazol-2-ylcarbamate

5



The title compound was prepared utilizing the procedure of Intermediate Example 4E, except that *tert*-butyl 5-[(2-chloropyrimidin-4-yl)amino]-1-methyl-1H-benzimidazol-2-ylcarbamate was used as a starting material.

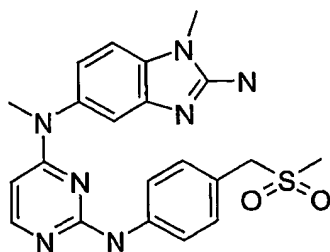
10

<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 7.98 (d, *J*=6.0 Hz, 1H), 7.44 (s, 1H), 7.21-7.16 (m, 3H), 6.31 (d, *J*=5.8 Hz, 1H), 3.38 (s, 3H), 3.29 (s, 3H), 1.58 (s, 9H).

## Intermediate Example 53

*N*<sup>5</sup>, 1-dimethyl-*N*<sup>5</sup>-[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1H-benzimidazole-2,5-diamine

15



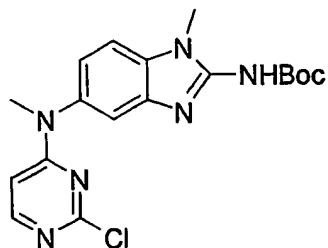
The title compound was prepared utilizing the procedure of Scheme 1 and Example 1, except that *N*<sup>5</sup>-(2-Chloropyrimidin-4-yl)-*N*<sup>2</sup>, *N*<sup>5</sup>,1-dimethyl-1H-benzimidazole-2,5-diamine was used as a starting material.

20

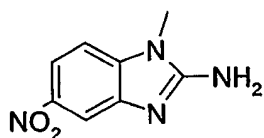
<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 9.23 (s, 1H), 7.81-7.78 (m, 3H), 7.25-7.19 (m, 3H), 7.04 (m, 1H), 6.82 (m, 1H), 6.56 (br s, 2H), 5.65 (d, *J*=5.9 Hz, 1H), 4.36 (s, 2H), 3.53 (s, 3H), 3.44 (s, 3H), 2.86 (s, 3H). MS (ESI) *m/z* = 438 [M+H]<sup>+</sup>.

## 25 Intermediate Example 54

*N<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1, N<sup>5</sup>-dimethyl-1 H -benzoimidazole-2,5-diamine*



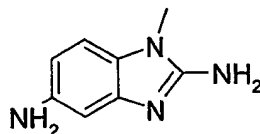
5 *A.1-Methyl-5-nitro-1 H -benzoimidazol-2-ylamine*



To a solution of *N*<sup>1</sup>-Methyl-4-nitro-benzene-1,2-diamine (5 g, 30 mmol) in MeOH was added bromide isothiocyanate (4.4 g, 42 mmol) and the mixture was stirred at rt. After 16 h, 6N NaOH solution was added to the reaction mixture until Ph~10 and MeOH was then removed in vacuo. H<sub>2</sub>O was added and the solid was filtered and dried to give the title compound as an off white solid (5.2 g, 90%). MS (ESI) *m/z* = 193 [M+H]<sup>+</sup>.

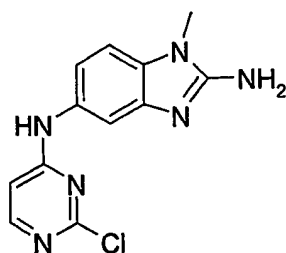
15

*B. 1-Methyl-1H-benzoimidazole-2,5-diamine*



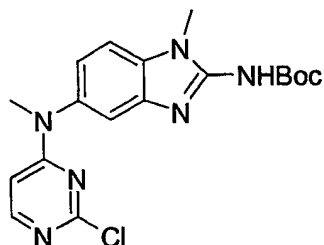
To a solution of 1-Methyl-5-nitro-1 H -benzoimidazol-2-ylamine (0.19 g , 1 mmol) 10% Pd/C (50 mg) in ethanol (10 ml) was added hydrazine (0.5 ml) and the reaction was heated to 80 °C. After TLC showed the starting material to be consumed, the reaction was cooled to rt and passed through a plug of celite. The filtrate was concentrated to give the title compound as an off-white solid. MS (ESI) *m/z* = 163 [M+H]<sup>+</sup>.

25 *C. N<sup>5</sup> -(2-Chloro-pyrimidin-4-yl)-1-methyl-1 H -benzoimidazole-2,5-diamine*



To a solution of 1-Methyl-1H-benzimidazole-2,5-diamine (0.63 g, 3.89 mmol) in THF (4 ml) and ethanol (12 ml) was added NaHCO<sub>3</sub> (0.98 g, 11.67 mmol) and 2,4-dichloropyrimidine (1.45 g, 9.7 mmol) and the reaction was heated to 80 °C. After 5 h, the reaction was filtered hot and concentrated to a gray foam. Ether was added and the solid was filtered and dried to give N<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1-methyl-1H-benzimidazole-2,5-diamine as a red solid. MS (ESI) m/z = 275 [M+H]<sup>+</sup>.

D. {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzimidazol-2-yl}-carbamic acid tert-butyl ester



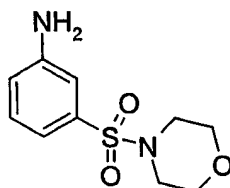
To a solution of N<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1-methyl-1H-benzimidazole-2,5-diamine (137 mg, 0.5 mmol) in THF (17 ml) was added triethylamine (0.7 ml, 0.5 mmol) and di-tert-butyl dicarbonate 1 M in THF (0.5 ml, 0.5 mmol) and the reaction was stirred at rt for 16h. The reaction was diluted with water and extracted with CH<sub>2</sub>Cl<sub>2</sub>. The combined organic layers were washed with water, dried over MgSO<sub>4</sub> and concentrated to an off white solid.

This solid was dissolved in DMF (2 ml) and cesium carbonate (0.2 g, 0.626 mmol) was added, the reaction mixture was stirred at rt. After 15 min, iodomethane (0.022 ml, 0.344 mmol) was added, and the reaction was stirred at rt. After TLC showed the starting material to be consumed, the reaction was diluted with water. The aqueous layer was extracted with CH<sub>2</sub>Cl<sub>2</sub>. The combined organic layers were washed with water, dried over MgSO<sub>4</sub> and concentrated to a red foam. The crude

material was purified with silica gel chromatography to give the title compound as a white solid (0.058 mg, 45% over two steps). MS (ESI)  $m/z = 389 [M+H]^+$ .

### Intermediate Example 55

#### 5 3-(Morpholine-4-sulfonyl)-phenylamine



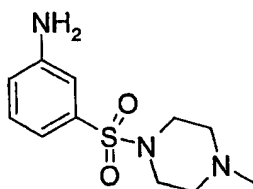
Morpholine (2.2ml, 25 mmol) was slowly added to 3-Nitro-benzenesulfonyl chloride (5.5 g, 25 mmol) in  $CH_2Cl_2$  at 0 °C. The reaction was warmed up to rt in 0.5 h.

- 10 After  $CH_2Cl_2$  was removed in vacuo, saturated  $NaHCO_3$  solution was added and the solid was filtered and dried to give 4-(3-Nitro-benzenesulfonyl)-morpholine as an off white solid (5.9 g, 87%). MS (ESI)  $m/z = 273 [M+H]^+$ .

- 15 4-(3-Nitro-benzenesulfonyl)-morpholine (5.9 g, 21.7 mmol) was combined with 10% palladium on carbon (1 g), ethanol (60 mL), and hydrazine (5 mL) and heated at reflux for 18 h. The solution was filtered through celite, concentrated, and cooled to 0 °C. Product precipitated out an colorless crystal (4.7 g, 89%). MS (ESI)  $m/z = 243 [M+H]^+$ .

### Intermediate Example 56

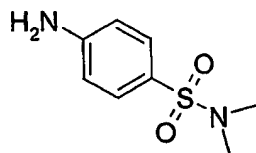
#### 20 3-(4-Methyl-piperazine-1-sulfonyl)-phenylamine



- 25 The title compound was prepared following the procedure of intermediate Example 2 with to 3-Nitro-benzenesulfonyl chloride (4.4g, 20 mmol) and N-methyl-piperazine( 2.2 ml 20 mmol) as an off white solid (3.6 g, 70%). MS (ESI)  $m/z = 256 [M+H]^+$ .

## Intermediate Example 57

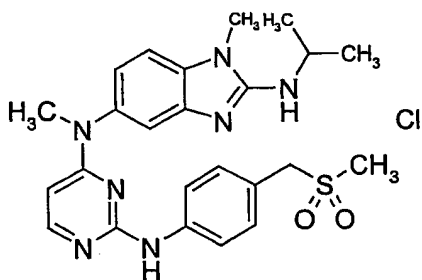
## 4-Amino-N, N-dimethyl-benzenesulfonamide



- The title compound was prepared following the procedure of intermediate Example 2 with to 3-Nitro-benzenesulfonyl chloride (6.6g, 30 mmol) dimethylamine 2M in MeOH ( 15 ml, 30 mmol) as an off white solid (4.8 g, 70%). MS (ESI)  $m/z$  = 232  $[M+H]^+$ .

## Example 1

- N<sup>2</sup>-Isopropyl-N<sup>5</sup>,1-dimethyl-N<sup>5</sup>-[2-({4-[(methylsulfonyl)methyl]phenyl} amino)pyrimidin-4-yl]-1H-benzimidazole-2,5-diamine hydrochloride*



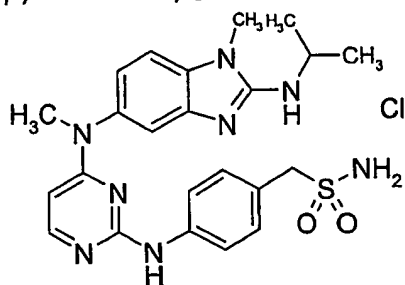
15

- To a solution of *N<sup>5</sup>-(2-chloropyrimidin-4-yl)-N<sup>2</sup>-isopropyl-N<sup>5</sup>,1-dimethyl-1H-benzimidazole-2,5-diamine* (83 mg, 0.25 mmol) and 4-[(methylsulfonyl)methyl]aniline (46 mg, 0.25 mmol) in ethanol (2.5 ml) was added a solution of HCl (0.25 ml, 1M in diethyl ether), and the reaction was heated to 70 °C. After 5 h, the precipitate was filtered off and washed with ethanol and dried to give the title compound as a white solid (104 mg, 87%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.1 (s, 1H), 8.74 (m, 1H), 7.93 (d,  $J$  = 6.6 Hz, 1H), 7.60 –7.65 (m, 3H), 7.41 (s, 1H), 7.24–7.29 (m, 3H), 5.90 (s, 1H), 4.39 (s, 2H), 4.09 (m, 1H), 3.69 (s, 3H), 3.49 (s, 3H), 2.87 (s, 3H), 1.33 (d,  $J$  = 6.6 Hz, 6H) ppm. MS (ESI)  $m/z$  = 480  $[M+H]^+$ .

25

## Example 2

*N*<sup>2</sup>-Isopropyl-*N*<sup>5</sup>,1-dimethyl-*N*<sup>5</sup>-[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1*H*-benzimidazole-2,5-diamine hydrochloride



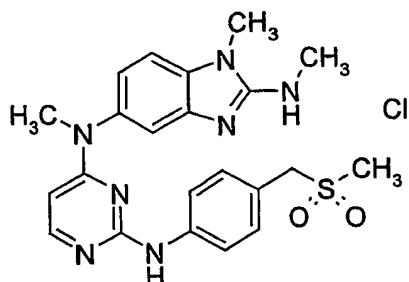
5

To a solution of *N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>2</sup>-isopropyl-*N*<sup>5</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine (83 mg, 0.25 mmol) and 1-(4-aminophenyl)methanesulfonamide (47 mg, 0.25 mmol) in ethanol (2.5 ml) was added a solution of HCl (0.25 ml, 1M in diethyl ether) and the reaction was heated to 70 °C. After 20 hours, the reaction mixture was neutralized with the addition of solid NaHCO<sub>3</sub>. The mixture was filtered and the filtrate was purified with silica gel to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.16 (s, 1H), 7.78 (m, 3H), 7.19 (d, J = 8.1 Hz, 3H), 7.09 (d, J = 1.8 Hz, 1H), 6.82 (dd, J = 8.1 and 1.8 Hz, 1H), 6.75 (s, 2H), 6.49 (d, J = 7.8 Hz, 1H), 5.62 (d, J = 6.0 Hz, 1H), 4.15 (s, 2H), 4.02 (m, 1H), 3.51 (s, 3H), 3.44 (s, 3H), 1.24 (d, J = 6.6 Hz, 6H) ppm. MS (ESI) m/z = 481 [M+H]<sup>+</sup>.

15

### Example 3

1- $\{4-[(4-\{Methyl[1-methyl-2-(methylamino)-1H-benzimidazol-5-yl]amino\}pyrimidin-2-yl)amino]phenyl\}$ methanesulfonamide hydrochloride

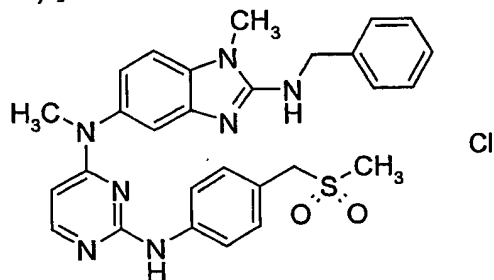


5

The title compound was prepared following the procedure of Example 1 with *N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>2</sup>,*N*<sup>5</sup>,1-trimethyl-1*H*-benzimidazole-2,5-diamine (62 mg, 0.21 mmol) and 4-[(methanesulfonyl)methyl]aniline (39 mg, 0.21 mmol) as a white solid (73 mg, 72%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.22 (s, 1H), 9.32 (d, *J* = 4.5 Hz, 1H), 7.94 (d, *J* = 6.6 Hz, 1H), 7.62 (d, *J* = 8.4 Hz, 3H), 7.43 (d, *J* = 1.8 Hz, 1H), 7.24 – 7.30 (m, 3H), 5.91 (d, *J* = 5.7 Hz, 1H), 4.40 (s, 2H), 3.69 (s, 3H), 3.49 (s, 3H), 3.07 (d, *J* = 4.5 Hz, 3H), 2.87 (s, 3H). MS (ESI) *m/z* = 452 [*M*+H]<sup>+</sup>.

### 15 Example 4

*N*<sup>2</sup>-benzyl-*N*<sup>5</sup>,1-dimethyl-*N*<sup>5</sup>-[2-({4-[(methanesulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1*H*-benzimidazole-2,5-diamine hydrochloride



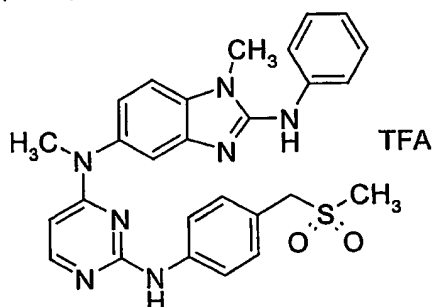
20

The title compound was prepared following the procedure of Example 1 with *N*<sup>2</sup>-benzyl-*N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>5</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine (95 mg, 0.25 mmol) and 4-[(methanesulfonyl)methyl]aniline (46 mg, 0.25 mmol) as a white solid (138 mg, 95%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.20 (s, 1H), 7.76 – 7.80 (m, 3H), 7.38 – 7.41 (m, 3H), 7.29 – 7.34 (m, 2H), 7.22 – 7.24 (m, 4H), 7.08 (d, *J* = 1.8 Hz, 1H),

6.84 (dd,  $J = 8.1$  and  $1.8$  Hz, 1H), 5.63 (d,  $J = 6.0$  Hz, 1H), 4.60 (d,  $J = 6.0$  Hz, 2H), 4.34 (s, 2H), 3.58 (s, 3H), 3.43 (s, 3H), 2.85 (s, 3H). MS (ESI)  $m/z = 527$   $[M+H]^+$ .

## 5 Example 5

*N*<sup>5</sup>,1-Dimethyl-*N*<sup>5</sup>-[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-*N*<sup>2</sup>-phenyl-1*H*-benzimidazole-2,5-diamine trifluoroacetic acid

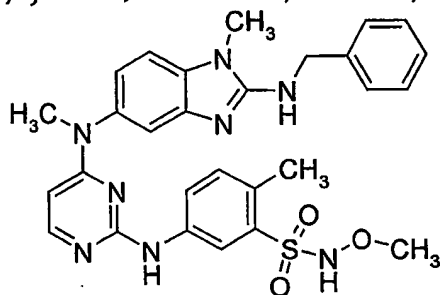


- 10 To a solution of *tert*-butyl 5-[(2-chloropyrimidin-4-yl)(methyl)amino]-1-methyl-1*H*-benzimidazol-2-yl(phenyl)carbamate (100 mg, 0.22 mmol) and 4-[(methylsulfonyl)methyl]aniline (41 mg, 0.22 mmol) in ethanol (2.5 ml) was added a solution of HCl (1 drop, 1M in diethyl ether) and the reaction was heated to 70 °C. After 20 hours, the reaction mixture was neutralized with the addition of solid
- 15 NaHCO<sub>3</sub>. The mixture was filtered and the filtrate was purified with silica gel. The collected product was stirred in 5 ml of a 1:1 TFA/methylene chloride solution for 3 h. The reaction was concentrated to give the title compound as a white solid (116 mg, 84%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO)  $\delta$  10.6 (s, 1H), 9.83 (br s, 1H), 7.78 (d,  $J = 6.9$  Hz, 1H), 7.70 (d,  $J = 8.1$  Hz, 2H), 7.57 – 7.60 (m, 3H), 7.32 – 7.44 (m, 5H), 7.11 – 7.21 (m, 2H), 5.93 (br s, 1H), 4.43 (s, 2H), 3.79 (s, 3H), 3.53 (s, 3H), 2.87 (s, 3H). MS (ESI)  $m/z =$
- 20 514  $[M+H]^+$ .



## Example 6

5-({4-[[2-(Benzylamino)-1-methyl-1H-benzimidazol-5-yl](methyl)amino]pyrimidin-2-yl}amino)-N-methoxy-2-methylbenzenesulfonamide

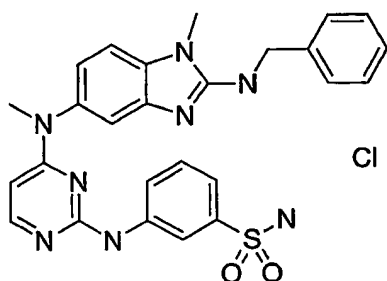


5

The title compound was prepared following the procedure of Example 2 with *N*<sup>2</sup>-benzyl-*N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>6</sup>,1-dimethyl-1H-benzimidazole-2,5-diamine (50 mg, 0.13 mmol) and 5-amino-*N*-methoxy-2-methylbenzenesulfonamide (30 mg, 0.14 mmol) as a white solid (58 mg, 0.10 mmol) after silica gel chromatography with methanol in dichloromethane. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.3 (s, 1H), 9.42 (s, 1H), 8.73 (s, 1H), 7.76 – 7.80 (m, 2H), 7.40 – 7.23 (m, 8H), 7.09 (br s, 1H), 6.84 (d, J = 7.4 Hz, 1H), 5.61 (d, J = 5.3 Hz, 1H), 4.60 (br s, 2H), 4.34 (s, 2H), 3.58 (s, 6H), 3.46 (s, 3H). MS (ESI) m/z = 559 [M+H]<sup>+</sup>.

## 15 Example 7

3-{4-[(2-Benzylamino-1-methyl-1H-benzimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide hydrochloride



20

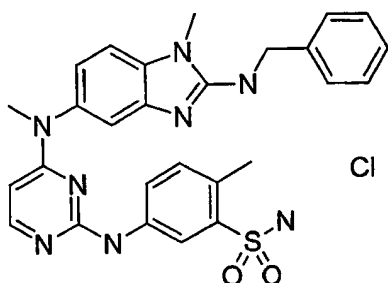
The title compound was prepared following the procedure of Example 1 with *N*<sup>2</sup>-benzyl-*N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>6</sup>,1-dimethyl-1H-benzimidazole-2,5-diamine (95 mg, 0.25 mmol) and 3-amino-benzenesulfonamide (43 mg, 0.25 mmol) as a light pink solid (112 mg, 82%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 10.03 (br s, 2H), 9.55

25

(br s, 1H), 8.48 (s, 1H), 7.89 (d,  $J = 6.3$  Hz, 1H), 7.74 (m, 1H), 7.59 (d,  $J = 8.7$  Hz, 1H), 7.51 (m, 2H), 7.22–7.41 (m, 8H), 5.76 (d,  $J = 6.3$  Hz, 1H), 4.76 (d,  $J = 5.7$  Hz, 2H), 3.763 (s, 3H), 3.48 (s, 3H). MS (ESI)  $m/z = 515$   $[M+H]^+$ .

## 5 Example 8

5- $\{4-[(2\text{-Benzylamino-1-methyl-1H-benzoimidazol-5-yl})\text{-methyl-amino}]\text{-pyrimidinylamino}\}$ -2-methyl-benzenesulfonamide hydrochloride



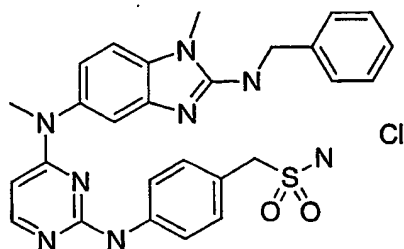
10

The title compound was prepared following the procedure of Example 1 with  $N^2$ -benzyl- $N^5$ -(2-chloropyrimidin-4-yl)- $N^5$ ,1-dimethyl-1H-benzimidazole-2,5-diamine (95 mg, 0.25 mmol) and 5-amino-2-methyl-benzenesulfonamide (47 mg, 0.25 mmol) to give the desired product as a pink solid (114 mg, 81%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO + NaHCO<sub>3</sub>)  $\delta$  10.31 (br s, 2H), 9.61 (br s, 1H), 8.46 (s, 1H), 7.88 (d,  $J = 6.6$  Hz, 1H), 7.63 (m, 2H), 7.51 (d,  $J = 7.5$  Hz, 2H), 7.23–7.39 (m, 7H), 5.77 (d,  $J = 6.3$  Hz, 1H), 4.77 (d,  $J = 6.0$  Hz, 2H), 3.74 (s, 3H), 3.50 (s, 3H), 2.52 (s, 3H). MS (ESI)  $m/z = 529$   $[M+H]^+$ .

15

## Example 9

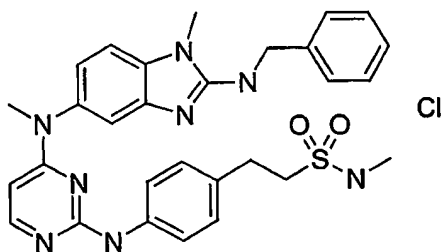
20 (4- $\{4-[(2\text{-Benzylamino-1-methyl-1H-benzoimidazol-5-yl})\text{-methyl-amino}]\text{-pyrimidin-2-ylamino}\}$ -phenyl)-methanesulfonamide hydrochloride



25

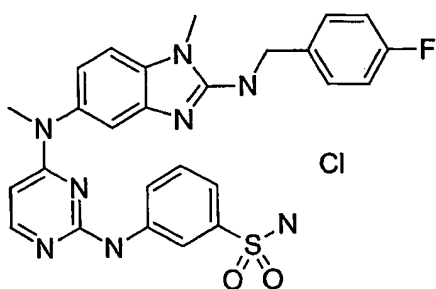
The title compound was prepared following the procedure of Example 1 with  $N^2$ -benzyl- $N^5$ -(2-chloropyrimidin-4-yl)- $N^5$ ,1-dimethyl-1H-benzimidazole-2,5-diamine (95

10 2-(4-{4-[(2-Benzylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-  
pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide hydrochloride



The title compound was prepared following the procedure of Example 1 with *N*<sup>2</sup>-benzyl-*N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>6</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine (95 mg, 0.25 mmol) and 2-(4-amino-phenyl)-ethanesulfonic acid methylamide (54 mg, 0.25 mmol) to give the desired product as a white solid (49 mg, 33%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.97 (br s, 1H), 9.34 (br s, 1H), 7.85 (d, *J* = 6.6 Hz, 1H), 7.49-7.59 (m, 5H), 7.25-7.37 (m, 4H), 7.17 (d, *J* = 8.1 Hz, 3H), 7.03 (q, *J* = 5.4 Hz, 1H), 5.77 (d, *J* = 6.6 Hz, 1H), 4.74 (d, *J* = 5.1 Hz, 2H), 3.72 (s, 3H), 3.46 (s, 3H), 3.21-3.27 (m, 2H), 2.85-2.91 (m, 2H), 2.58 (d, *J* = 4.8 Hz, 3H). MS (ESI) *m/z* = 557 [M+H]<sup>+</sup>.

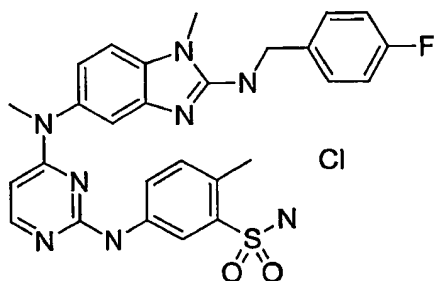
25 3-(4-{[2-(4-Fluoro-benzylamino)-1-methyl-1H-benzimidazol-5-yl]-methyl-amino}-  
pyrimidin-2-ylamino)-benzenesulfonamide hydrochloride



The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(4-fluoro-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzimidazole-2,5-diamine (99 mg, 0.25 mmol) and 3-amino-benzenesulfonamide (43 mg, 0.25 mmol) as a white solid (104 mg, 73%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ10.08 (br s, 1H), 9.57 (br s, 1H), 8.46 (s, 1H), 7.87 (d, J = 1.8 Hz, 1H), 7.73 (m, 1H), 7.55-7.58 (m, 3H), 7.40 (d, J = 3.3 Hz, 2H), 7.35 (s, 1H), 7.30 (s, 2H), 7.16-7.23 (m, 3H), 5.74 (d, J = 4.5 Hz, 1H), 4.73 (d, J = 4.2 Hz, 2H), 3.71 (s, 3H), 3.47 (s, 3H). MS (ESI) m/z = 533 [M+H]<sup>+</sup>.

#### 10 Example 12

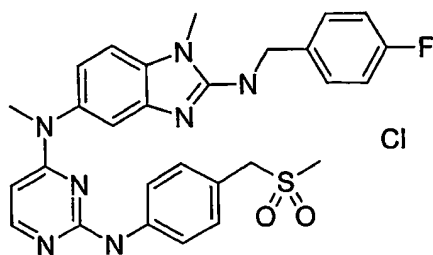
*5-(4-{[2-(4-Fluoro-benzylamino)-1-methyl-1H-benzimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide hydrochloride*



The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(4-fluoro-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzimidazole-2,5-diamine (99 mg, 0.25 mmol) and 5-amino-2-methyl-benzenesulfonamide (47 mg, 0.25 mmol) as a white solid (69 mg, 48%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ10.28 (br s, 1H), 9.61 (br s, 1H), 8.45 (s, 1H), 7.86 (d, J = 2.1 Hz, 1H), 7.63 (m, 1H), 7.52-7.59 (m, 3H), 7.37 (s, 1H), 7.31 (s, 2H), 7.13-7.26 (m, 4H), 5.74 (d, J = 4.5 Hz, 1H), 4.73 (d, J = 4.5 Hz, 2H), 3.71 (s, 3H), 3.48 (s, 3H), 2.50 (s, 3H). MS (ESI) m/z = 547 [M+H]<sup>+</sup>.

#### Example 13

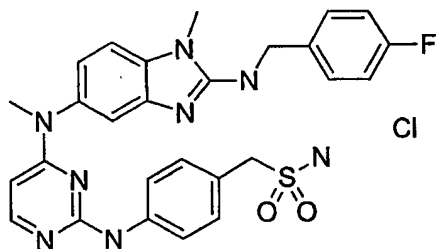
*N*<sup>2</sup>-(4-Fluoro-benzyl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine hydrochloride



- 5 The title compound was prepared following the procedure of example two with *N*<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(4-fluoro-benzyl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine (99 mg, 0.25 mmol) and 4-[(methanesulfonyl)methyl]aniline (46 mg, 0.25 mmol) as a white solid (69 mg, 48%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.20 (s, 1H), 7.76–7.80 (m, 3H), 7.41–7.46 (m, 3H), 7.23 (d, *J* = 8.4 Hz, 3H), 7.09–7.17 (m, 3H), 6.84 (dd, *J* = 8.4 and 1.8 Hz, 1H), 5.63 (d, *J* = 6.0 Hz, 1H), 4.57 (d, *J* = 5.7 Hz, 2H), 4.34 (s, 2H), 3.57 (s, 3H), 3.43 (s, 3H), 2.85 (s, 3H). MS (ESI) *m/z* = 546 [*M*+H]<sup>+</sup>.

#### Example 14

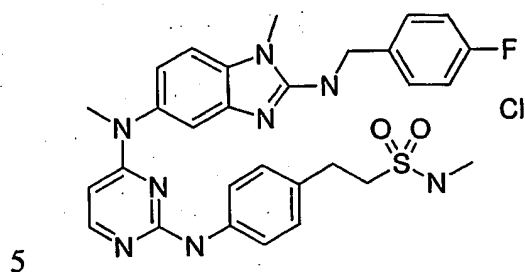
- 15 *[4-(4-{[2-(4-Fluoro-benzylamino)-1-methyl-1*H*-benzimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide hydrochloride*



- 20 The title compound was prepared following the procedure of example two with *N*<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(4-fluoro-benzyl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine (99 mg, 0.25 mmol) and (4-amino-phenyl)-methanesulfonamide (46 mg, 0.25 mmol) as a white solid (50 mg, 34%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.16 (s, 1H), 7.75–7.78 (m, 3H), 7.38–7.46 (m, 3H), 7.08–7.24 (m, 6H), 6.84 (dd, *J* = 8.2 and 1.6 Hz, 1H), 6.75 (br s, 2H), 5.61 (d, *J* = 6.0 Hz, 1H), 4.57 (d, *J* = 5.7 Hz, 2H), 4.15 (s, 2H), 3.56 (s, 3H), 3.43 (s, 3H). MS (ESI) *m/z* = 547 [*M*+H]<sup>+</sup>.

#### 25 Example 15

2-[4-(4-{[2-(4-Fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide hydrochloride



The title compound was prepared following the procedure of example two with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(4-fluoro-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (99 mg, 0.25 mmol) and 2-(4-amino-phenyl)-ethanesulfonic acid methylamide (54 mg, 0.25 mmol) to give the desired product as a white solid (90 mg, 59%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.04 (s, 1H), 7.68-7.75 (m, 3H), 7.41-7.46 (m, 3H), 7.23 (d, J = 8.1 Hz, 1H), 7.08-7.17 (m, 4H), 6.94 (q, J = 5.1 Hz, 1H), 6.83 (dd, J = 8.1 and 1.5 Hz, 1H), 5.59 (d, J = 6.0 Hz, 1H), 4.57 (d, J = 5.4 Hz, 2H), 3.56 (s, 3H), 3.41 (s, 3H), 3.20-3.26 (m, 2H), 2.83-2.88 (m, 2H), 2.59 (d, J = 5.1 Hz, 3H). MS (ESI) m/z = 575 [M+H]<sup>+</sup>.

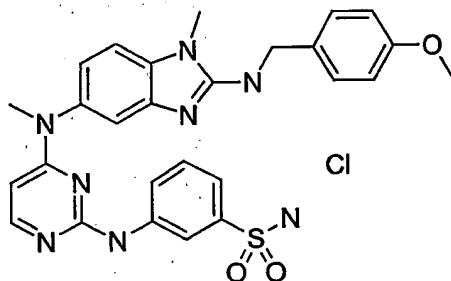
10

15

### Example 16

3-(4-{[2-(4-Methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide hydrochloride

20



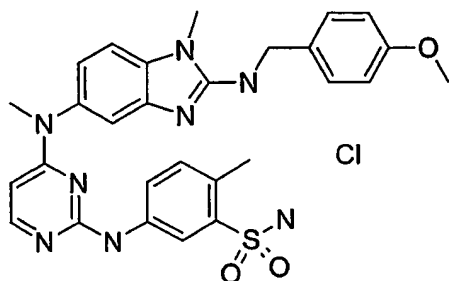
The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(4-methoxy-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (82 mg, 0.20 mmol) and 3-amino-benzenesulfonamide (34 mg, 0.20 mmol) as a white solid (83 mg, 72%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 10.28 (br s, 2H), 9.53 (br s, 1H), 8.44 (s, 1H), 7.91 (d, J = 6.6 Hz, 1H), 7.73 (M, 1H), 7.64 (d, J =

25

8.4 Hz, 1H), 7.43 (d,  $J = 8.4$  Hz, 4H), 7.28-7.34 (m, 3H), 6.94 (d,  $J = 8.4$  Hz, 2H), 5.81 (m, 1H), 4.67 (d,  $J = 5.7$  Hz, 2H), 3.74 (s, 3H), 3.71 (s, 3H), 3.50 (s, 3H). MS (ESI)  $m/z = 545$   $[M+H]^+$ .

## 5 Example 17

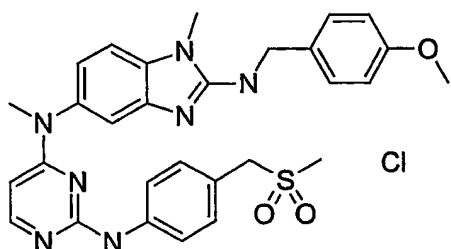
*5-(4-{[2-(4-Methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide hydrochloride*



- 10 The title compound was prepared following the procedure of example one with  $N^5$ -(2-chloro-pyrimidin-4-yl)- $N^2$ -(4-methoxy-benzyl)-1, $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine (82 mg, 0.20 mmol) and 5-amino-2-methyl-benzenesulfonamide (37 mg, 0.20 mmol) as a white solid (89 mg, 75%).  $^1H$  NMR (300 MHz,  $d_6$ -DMSO +  $NaHCO_3$ )  $\delta$ 10.25 (br s, 2H), 9.50 (br s, 1H), 8.46 (s, 1H), 7.88 (d,  $J = 6.6$  Hz, 1H), 7.60-7.67 (m, 2H),  
15 7.41-7.46 (m, 3H), 7.23-7.32 (m, 4H), 6.93 (d,  $J = 8.7$  Hz, 2H), 5.78 (d,  $J = 6.3$  Hz, 1H), 6.68 (d,  $J = 5.7$  Hz, 2H), 3.74 (s, 3H), 3.71 (s, 3H), 3.51 (s, 3H), 2.53 (s, 3H). MS (ESI)  $m/z = 559$   $[M+H]^+$ .

## Example 18

- 20  *$N^5$ -[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^2$ -(4-methoxy-benzyl)-1, $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine hydrochloride*

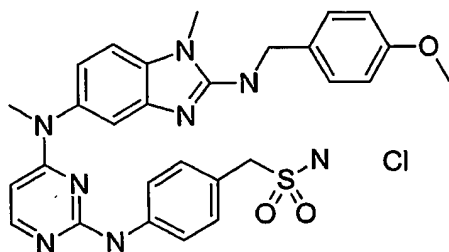


- The title compound was prepared following the procedure of example two with  $N^5$ -(2-chloro-pyrimidin-4-yl)- $N^2$ -(4-methoxy-benzyl)-1, $N^5$ -dimethyl-1H-benzoimidazole-

2,5-diamine (82 mg, 0.20 mmol) and 4-[(methylsulfonyl)methyl]aniline (37 mg, 0.20 mmol) as a white solid (86 mg, 72%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.21 (s, 1H), 7.76-7.81 (m, 3H), 7.29-7.34 (m, 3H), 7.21-7.25 (m, 3H), 7.09 (d, J = 1.8 Hz, 1H), 6.82-6.90 (M, 3H), 5.64 (d, J = 6.0 Hz, 1H), 4.52 (d, J = 5.7 Hz, 2H), 4.35 (s, 2H), 3.72 (s, 3H), 3.56 (s, 3H), 3.43 (s, 3H), 2.85 (s, 3H). MS (ESI) m/z = 558 [M+H]<sup>+</sup>.

### Example 19

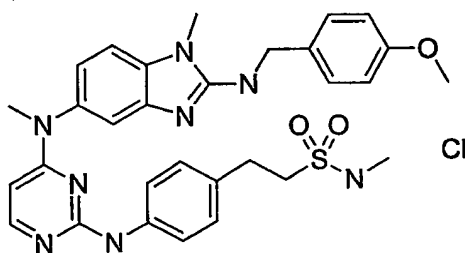
*[4-(4-{[2-(4-Methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide hydrochloride*



The title compound was prepared following the procedure of example two with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(4-methoxy-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (82 mg, 0.20 mmol) and (4-amino-phenyl)-methanesulfonamide (37 mg, 0.20 mmol) as a white solid (49 mg, 41%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.58 (br s, 1H), 9.00 (br s, 1H), 7.85 (d, J = 6.0 Hz, 1H), 7.68 (d, J = 8.1 Hz, 2H), 7.42-7.50 (M, 3H), 7.29 (s, 1H), 7.12-7.21 (m, 3H), 6.91 (d, J = 8.4 Hz, 2H), 6.80 (s, 2H), 5.75 (d, J = 5.7 Hz, 1H), 4.64 (d, J = 5.1 Hz, 2H), 4.17 (s, 2H), 3.73 (s, 3H), 3.68 (s, 3H), 3.46 (s, 3H). MS (ESI) m/z = 559 [M+H]<sup>+</sup>.

### Example 20

*2-[4-(4-{[2-(4-Methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide hydrochloride*



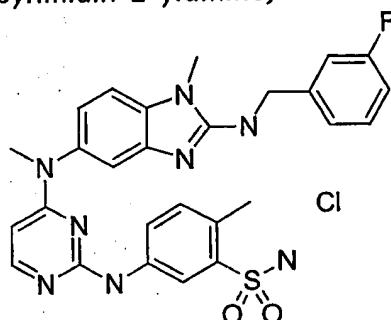


The title compound was prepared following the procedure of example two with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(4-methoxy-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (82 mg, 0.20 mmol) and 2-(4-amino-phenyl)-ethanesulfonic acid methylamide (43 mg, 0.20 mmol) as a white solid (105 g, 85%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.18 (br s, 1H), 9.46 (br s, 1H), 7.88 (d, J = 6.6 Hz, 1H), 7.54-7.62 (m, 3H), 7.40-7.47 (m, 3H), 7.18-7.26 (m, 3H), 7.01 (m, 1H), 6.92 (d, J = 8.4 Hz, 2H), 5.83 (d, J = 6.3 Hz, 1h), 4.68 (d, J = 5.4 Hz, 2H), 3.73 (s, 3H), 3.72 (s, 3H), 3.48 (s, 3H), 3.23-3.28 (m, 2H), 2.87-2.93 (m, 2H), 2.60 (d, J = 4.8 Hz, 3H). MS (ESI) m/z = 587 [M+H]<sup>+</sup>.

10

### Example 21

5-(4-{[2-(3-Fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide hydrochloride



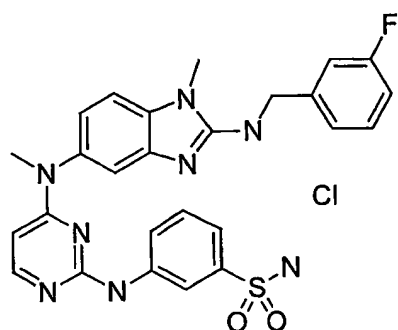
15 The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(3-fluoro-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (99 mg, 0.25 mmol) and 5-amino-2-methyl-benzenesulfonamide (47 mg, 0.25 mmol) as a white solid (96 mg, 66%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 10.06 (br s, 1h), 9.34 (br s, 1h), 8.49 (s, 1H), 7.84 (d, J = 6.6 Hz, 1H), 7.65 (d, J = 6.6 Hz, 1H), 7.56 (d, J = 8.4 Hz, 1H), 7.08-7.44 (m, 9H), 5.72 (d, J = 6.6 Hz, 1H), 4.75 (d, J = 6.6 Hz, 2H), 3.71 (s, 3H), 3.48 (s, 3H), 2.51 (s, 3H). MS (ESI) m/z = 547 [M+H]<sup>+</sup>.

20

### Example 22

3-(4-{[2-(3-Fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide hydrochloride

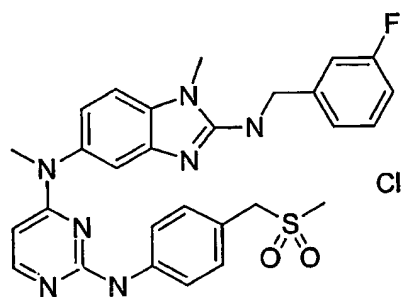
25



The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(3-fluoro-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzimidazole-2,5-diamine (99 mg, 0.25 mmol) and 3-amino-benzenesulfonamide (43 mg, 0.25 mmol) as a white solid (62 mg, 44%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.70 (s, 2H), 8.53 (s, 1H), 7.83 (d, J = 6.0 Hz, 1H), 7.74 (d, J = 6.6 Hz, 1H), 7.26-7.50 (M, 8H), 7.10 (m, 2H), 5.69 (d, J = 6.0 Hz, 1H), 4.70 (d, J = 5.1 Hz, 2H), 3.67 (s, 3H), 3.46 (s, 3H). MS (ESI) m/z = 533 [M+H]<sup>+</sup>.

#### Example 23

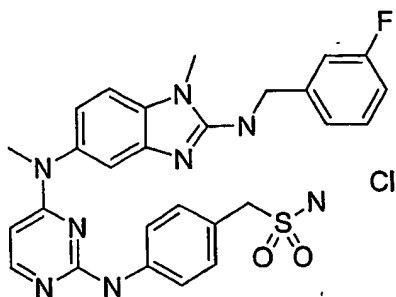
*N*<sup>2</sup>-(3-Fluoro-benzyl)-N<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,N<sup>5</sup>-dimethyl-1H-benzimidazole-2,5-diamine hydrochloride



The title compound was prepared following the procedure of example two with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(3-fluoro-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzimidazole-2,5-diamine (99 mg, 0.25 mmol) and 4-[(methanesulfonylmethyl)phenylamino]pyrimidin-2-amine (46 mg, 0.25 mmol) as a white solid (44 mg, 30%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.64 (s, 1H), 9.82 (s, 1H), 7.93 (d, J = 6.9 Hz, 1H), 7.57-7.66 (m, 3H), 7.28-7.43 (m, 7H), 7.12 (m, 1H), 5.94 (s, 1H), 4.80 (d, J = 5.7 Hz, 2H), 4.41 (s, 2H), 3.76 (s, 3H), 3.50 (s, 3H), 2.87 (s, 3H). MS (ESI) m/z = 546 [M+H]<sup>+</sup>.

#### Example 24

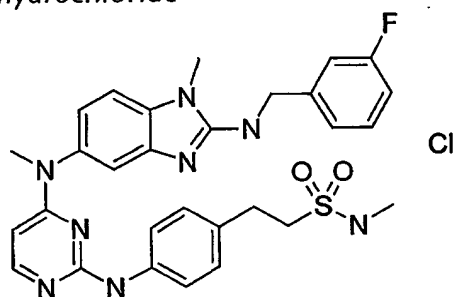
*[4-(4-{[2-(3-Fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide hydrochloride*



- 5 The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(3-fluoro-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (99 mg, 0.25 mmol) and (4-amino-phenyl)-methanesulfonamide (46 mg, 0.25 mmol) as a white solid (111 mg, 76%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 10.03 (br s, 2H), 9.37 (br s, 1H), 7.87 (d, J = 6.6 Hz, 1H), 7.54-7.64 (m, 2H), 7.32-7.44 (m, 3H), 7.19-7.24 (M, 3H), 7.08-7.14 (M, 1H), 6.81 (s, 2H), 5.82 (d, J = 6.0 Hz, 1H), 4.76 (d, J = 5.7 Hz, 2H), 4.18 (s, 2H), 3.72 (s, 3H), 3.47 (s, 3H). MS (ESI) m/z = 547 [M+H]<sup>+</sup>.

### Example 25

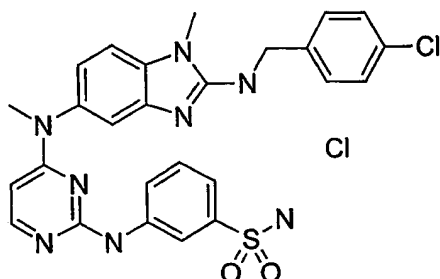
15 *2-[4-(4-{[2-(3-Fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide hydrochloride*



- 20 The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(3-fluoro-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (99 mg, 0.25 mmol) and 2-(4-amino-phenyl)-ethanesulfonic acid methylamide (54 mg, 0.25 mmol) as a white solid (74 mg, 49%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.66 (br s, 1H), 8.73 (br s, 1H), 7.81 (d, J = 6.6 Hz, 1H), 7.62 (d, J = 8.1 Hz, 2H), 7.36-7.49 (m, 2H), 7.27-7.31 (m, 3), 7.08-7.18 (m, 4H), 6.99 (q, J = 4.8 Hz, 1H), 5.73 (d, J = 6.3 Hz, 1H), 4.71 (d, J = 5.4 Hz, 2H), 3.68 (s, 3H), 3.45 (s, 3H), 3.22-3.27 (m, 2H), 2.86-2.91 (m, 2H), 2.59 (d, J = 4.8 Hz, 3H). MS (ESI) m/z = 575 [M+H]<sup>+</sup>.
- 25

### Example 26

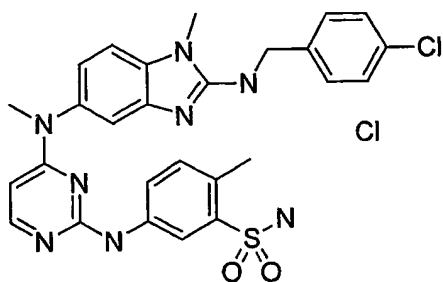
5 3-(4-{[2-(4-Chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide hydrochloride



The title compound was prepared following the procedure of example one with N<sup>2</sup>-(4-Chloro-benzyl)-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (103 mg, 0.25 mmol) and 3-amino-benzenesulfonamide (43 mg, 0.25 mmol) as a white solid (68 mg, 47%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.89 (br s, 1H), 8.49 (s, 1H), 7.86 (d, J = 6.3 Hz, 1H), 7.73 (m, 1H), 7.18-7.74 (m, 10H), 5.73 (d, J = 6.3 Hz, 1H), 4.71 (d, J = 5.7 Hz, 2H), 3.69 (s, 3H), 3.47 (s, 3H). MS (ESI) m/z = 549 [M+H]<sup>+</sup>.

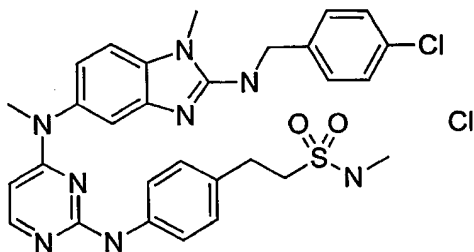
### 15 Example 27

5-(4-{[2-(4-Chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide hydrochloride



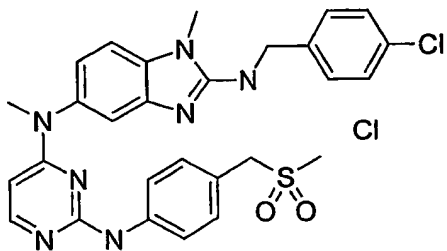
The title compound was prepared following the procedure of example one with N<sup>2</sup>-(4-Chloro-benzyl)-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (103 mg, 0.25 mmol) and 5-amino-2-methyl-benzenesulfonamide (47 mg, 0.25 mmol) as a white solid (106 mg, 71%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 10.17 (br s, 1H), 9.40 (br s, 1H), 8.45 (s, 1H), 7.85 (d, J = 6.6 Hz, 1H), 7.62 (m, 2H),

5 2-[4-(4-{[2-(4-Chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-  
amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide  
hydrochloride



- 10 The title compound was prepared following the procedure of example one with N<sup>2</sup>-(4-Chloro-benzyl)-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (103 mg, 0.25 mmol) and 2-(4-amino-phenyl)-ethanesulfonic acid methylamide (54 mg, 0.25 mmol) as a white solid (96 mg, 64%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 10.27 (br s, 1H), 9.34 (br s, 1H), 7.85 (d, J = 7.2 Hz, 1H), 7.61 (d, J = 8.4 Hz, 1H), 7.49–7.54 (m, 4H), 7.38–7.44 (m, 3H), 7.20–7.26 (m, 3H), 6.99 (q, J = 5.1 Hz, 1H), 5.83 (br s, 1H), 4.72 (d, J = 5.7 Hz, 2H), 3.71 (s, 3H), 3.48 (s, 3H), 3.22–3.28 (m, 2H), 2.87–2.93 (m, 2H), 2.58 (d, J = 4.8 Hz, 3H). MS (ESI) m/z = 562 [M+H]<sup>+</sup>.

20 *N*<sup>2</sup>-(4-Chloro-benzyl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine hydrochloride



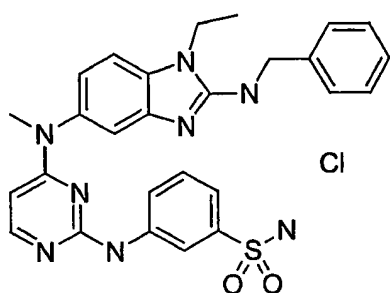
- The title compound was prepared following the procedure of example one with N<sup>2</sup>-(4-  
25 Chloro-benzyl)-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-1H-benzimidazole-2,5-  
diamine (103 mg, 0.25 mmol) and 4-[(methylsulfonyl)methyl]aniline (46 mg, 0.25  
mmol) as a white solid (61 mg, 41%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.20

(s, 1H), 7.76-7.80 (m, 3H), 7.36-7.43 (m, 5H), 7.24 (d, J = 8.1 Hz, 2H), 7.08 (d, J = 1.8 Hz, 1H), 6.85 (dd, J = 8.1 and 1.8 Hz, 1H), 5.63 (d, J = 6.0 Hz, 1H), 4.58 (d, J = 5.7 Hz, 2H), 4.34 (s, 2H), 3.58 (s, 3H), 3.43 (s, 3H), 2.85 (s, 3H). MS (ESI)  $m/z$  = 562  $[M+H]^+$ .

5

### Example 30

3-{4-[(2-Benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide hydrochloride



10

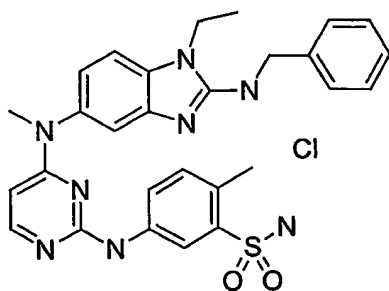
The title compound was prepared following the procedure of example one with N<sup>2</sup>-Benzyl-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1-ethyl-N<sup>5</sup>-methyl-1H-benzoimidazole-2,5-diamine

(98 mg, 0.25 mmol) and 3-amino-benzenesulfonamide (43 mg, 0.25 mmol) as a white solid (34 mg, 24%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.61 (s, 1H), 8.56 (s, 1H), 7.75-7.84 (m, 2H), 7.23-7.45 (m, 11H), 7.04 (d, J = 7.2 Hz, 1H), 5.71 (d, J = 5.7 Hz, 1H), 4.68 (d, J = 5.1 Hz, 2H), 4.21 (m, 2H), 3.46 (s, 3H), 1.28 (mm, 3H). MS (ESI)  $m/z$  = 529  $[M+H]^+$ .

20

### Example 31

5-{4-[(2-Benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-2-methyl-benzenesulfonamide hydrochloride

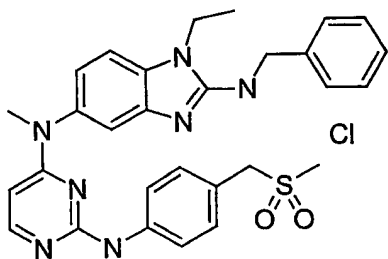


The title compound was prepared following the procedure of example one with N<sup>2</sup>-Benzyl-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1-ethyl-N<sup>5</sup>-methyl-1H-benzoimidazole-2,5-diamine

(98 mg, 0.25 mmol) and 5-amino-2-methyl-benzenesulfonamide (46 mg, 0.25 mmol) as a white solid (83 mg, 58%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.54 (s, 1H), 8.56 (s, 1H), 7.80 (d, J = 6.3 Hz, 1H), 7.68 (dd, J = 8.2 and 1.6 Hz, 1H), 7.15-7.47 (m, 10H), 7.03 (d, J = 7.8 Hz, 1H), 5.69 (d, J = 6.0 Hz, 1H), 4.68 (d, J = 5.7 Hz, 2H), 4.21 (m, 2H), 3.46 (s, 3H), 2.50 (s, 3H), 1.28 (t, J = 6.9 Hz, 3H). MS (ESI) m/z = 543 [M+H]<sup>+</sup>.

### 10 Example 32

*N*<sup>2</sup>-Benzyl-1-ethyl-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>5</sup>-methyl-1H-benzoimidazole-2,5-diamine hydrochloride

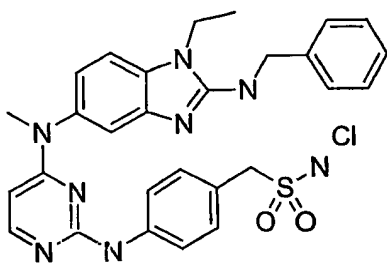


The title compound was prepared following the procedure of example two with N<sup>2</sup>-Benzyl-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1-ethyl-N<sup>5</sup>-methyl-1H-benzoimidazole-2,5-diamine

(98 mg, 0.25 mmol) and 4-[(methanesulfonyl)methyl]aniline (46 mg, 0.25 mmol) as a white solid (65 mg, 45%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.53 (s, 1H), 7.75 (m, 3H), 7.19-7.40 (M, 9H), 7.10 (s, 1H), 6.87 (m, 1H), 5.66 (m, 1H), 4.60 (m, 2H), 4.32 (s, 2H), 4.11 (m, 2H), 6.41 (s, 3H), 2.83 (s, 3H), 1.24 (M, 3H).

### Example 33

*(4-{4-[(2-Benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide hydrochloride*



The title compound was prepared following the procedure of example two with N<sup>2</sup>-Benzyl-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1-ethyl-N<sup>5</sup>-methyl-1H-benzoimidazole-2,5-diamine

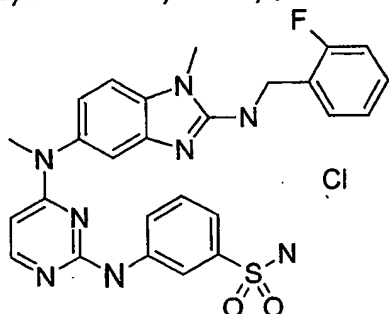
(98 mg, 0.25 mmol) and (4-amino-phenyl)-methanesulfonamide (46 mg, 0.25 mmol)

5 as a white solid (97 mg, 67%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.30 (s, 1H), 7.79 (d, J = 6.0 Hz, 1H), 7.75 (d, J = 8.7 Hz, 2H), 7.15-7.42 (M, 9H), 6.9+5 (d, J = 8.1 Hz, 1H), 6.77 (s, 2H), 5.69 (d, J = 6.0 Hz, 1H), 4.65 (d, J = 5.7 Hz, 2H), 4.16-4.18 (m, 4H), 3.44 (s, 3H), 1.27 (t, J = 7.2 Hz, 3H). MS (ESI) m/z = 543 [M+H]<sup>+</sup>.

10

### Example 34

3-(4-{[2-(2-Fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylmethyl)-benzenesulfonamide hydrochloride



15 The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(2-fluoro-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (60 mg, 0.15 mmol) and 3-amino-benzenesulfonamide (26 mg, 0.15 mmol) as a white solid (52 mg, 61%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.51 (s, 1H), 8.60 (s, 1H), 7.78 (d, J = 6.0 Hz, 2H), 7.62 (br s, 1H), 7.47 (t, J = 7.8 Hz, 1H), 7.12-7.41 (M, 9H), 6.89 (d, J = 8.1 Hz, 1H), 5.64 (d, J = 6.3 Hz, 1H), 4.66 (d, J = 5.4 Hz, 2H), 3.61 (s, 3H), 3.45 (s, 3H). MS (ESI) m/z = 533 [M+H]<sup>+</sup>.

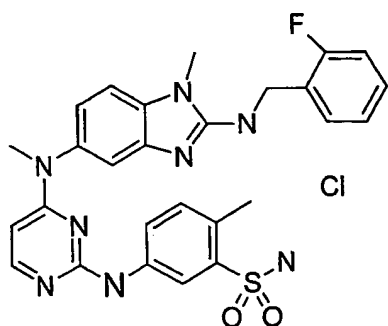
20

### Example 35

5-(4-{[2-(2-Fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide hydrochloride

25

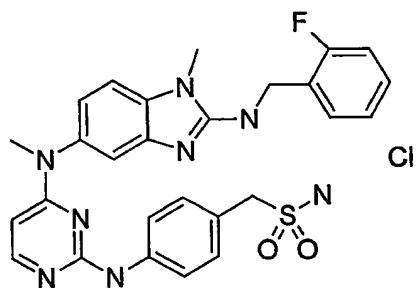




- The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(2-fluoro-benzyl)-1,N<sup>6</sup>-dimethyl-1H-benzimidazole-2,5-diamine (60 mg, 0.15 mmol) and 5-amino-2-methyl-benzenesulfonamide (28 mg, 0.15 mmol) as a white solid (69 mg, 79%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.71 (s, 1H), 8.55 (s, 1H), 7.81 (d, J = 6.0 Hz, 1H), 7.68 (dd, J = 8.1 and 1.8 Hz, 1H), 7.44–7.54 (m, 2H), 7.16–7.36 (m, 7H), 7.07 (d, J = 8.4 Hz, 1H), 5.68 (d, J = 6.3 Hz, 1H), 4.73 (d, J = 5.1 Hz, 2H), 3.67 (s, 3H), 3.47 (s, 3H), 2.50 (s, 3H). MS (ESI) m/z = 547 [M+H]<sup>+</sup>.

#### 10 Example 36

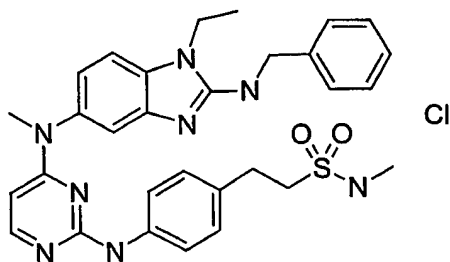
*[4-(4-{[2-(2-Fluoro-benzylamino)-1-methyl-1H-benzimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide hydrochloride*



- The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-N<sup>2</sup>-(2-fluoro-benzyl)-1,N<sup>6</sup>-dimethyl-1H-benzimidazole-2,5-diamine (60 mg, 0.15 mmol) and (4-amino-phenyl)-methanesulfonamide (28 mg, 0.15 mmol) as a white solid (30 mg, 34%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.58 (s, 1H), 7.83 (d, J = 6.3 Hz, 1H), 7.68 (d, J = 8.4 Hz, 2H), 7.49–7.53 (m, 2H), 7.33–7.40 (m, 1H), 7.17–7.27 (m, 4H), 7.09–7.12 (m, 1H), 6.79 (s, 2H), 5.76 (d, J = 6.0 Hz, 1H), 4.72 (d, J = 5.4 Hz, 2H), 4.18 (s, 2H), 3.67 (s, 3H), 3.46 (s, 3H). MS (ESI) m/z = 547 [M+H]<sup>+</sup>.

#### Example 37

2-(4-{4-[(2-Benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide hydrochloride



5 The title compound was prepared following the procedure of example two with N<sup>2</sup>-Benzyl-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1-ethyl-N<sup>5</sup>-methyl-1H-benzoimidazole-2,5-diamine

(98 mg, 0.25 mmol) and 2-(4-amino-phenyl)-ethanesulfonic acid methylamide (54 mg, 0.25 mmol) as a white solid (74 mg, 49%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO +

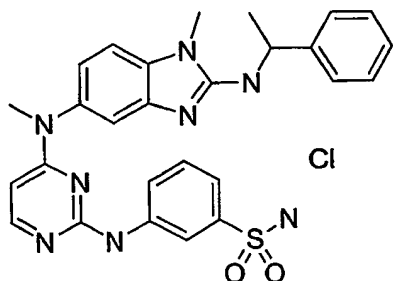
10 NaHCO<sub>3</sub>) δ 9.04 (s, 1H), 7.75 (d, J = 6.0 Hz, 1H), 7.69 (d, J = 8.4 Hz, 2H), 7.23-7.42 (m, 7H), 7.07-7.12 (m, 3H), 6.94 (q, J = 5.1 Hz, 1H), 6.83 (dd, J = 8.4 and 2.1 Hz, 1H), 5.63 (d, J = 5.7 Hz, 1H), 4.61 (d, J = 5.7 Hz, 2H), 4.11 (q, J = 6.9 Hz, 2H), 3.41 (s, 3H), 3.32 (s, 3H), 3.20-3.25 (M, 2H), 2.83-2.88 (M, 2H), 2.59 (d, J = 4.8 Hz, 3H), 1.26 (t, J = 6.9 Hz, 3H). MS (ESI) m/z = 571 [M+H]<sup>+</sup>.

15

### Example 38

3-(4-{Methyl-[1-methyl-2-(1-phenyl-ethylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide hydrochloride

20



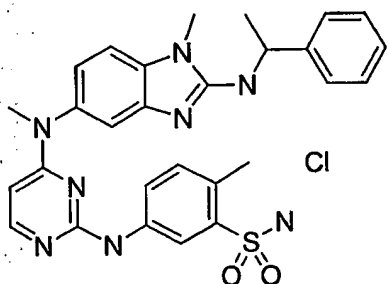
The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-N<sup>2</sup>-(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine (98 mg, 0.25 mmol) and 3-amino-benzenesulfonamide (43 mg, 0.25 mmol) as

25 a white solid (65 mg, 46%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.58 (s, 2H), 8.57 (s, 1H), 7.75-7.81 (m, 2H), 7.48-7.51 (m, 2H), 7.32-7.41 (m, 5H), 7.17-7.26 (m, 4H),

6.98-7.00 (m, 1H), 5.65 (d,  $J = 6.3$  Hz, 1H), 5.17 (m, 1H), 3.67 (s, 3H), 3.44 (s, 3H), 1.58 (d,  $J = 6.9$  Hz, 3H). MS (ESI)  $m/z = 529$   $[M+H]^+$ .

### Example 39

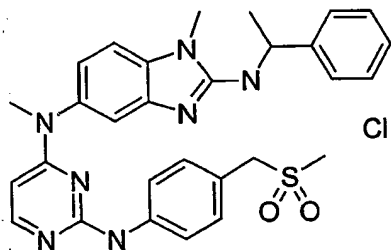
- 5 *2-Methyl-5-(4-{methyl-[1-methyl-2-(1-phenyl-ethylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide hydrochloride*



- 10 The title compound was prepared following the procedure of example one with  $N^5$ -(2-Chloro-pyrimidin-4-yl)-1, $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine (98 mg, 0.25 mmol) and 5-amino-2-methyl-benzenesulfonamide (46 mg, 0.25 mmol) as a white solid (90 mg, 63%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO +  $\text{NaHCO}_3$ )  $\delta$  9.85 (br s, 2H), 8.52 (s, 1H), 7.83 (d,  $J = 6.3$  Hz, 1H), 7.65-7.68 (dd,  $J = 8.1$  and 1.8 Hz, 1H), 7.51-7.57 (m, 3H), 7.34-7.39 (m, 2H), 7.25-7.30 (m, 4H), 7.15-7.22 (m, 2H), 5.70 (d,  $J =$   
15 6.3 Hz, 1H), 5.22 (m, 1H), 3.74 (s, 3H), 3.47 (s, 3H), 2.51 (s, 3H), 1.63 (d,  $J = 6.6$  Hz, 3H). MS (ESI)  $m/z = 543$   $[M+H]^+$ .

### Example 40

- 20  *$N^5$ -[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine hydrochloride*



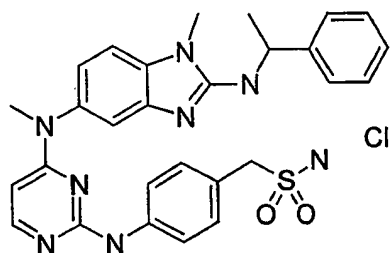
- The title compound was prepared following the procedure of example two with  $N^5$ -(2-Chloro-pyrimidin-4-yl)-1, $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine (98 mg, 0.25 mmol) and 4-[(methylsulfonyl)methyl]aniline (46 mg, 0.25 mmol) as a white solid (66 mg, 46%).  $^1\text{H}$  NMR (400 MHz,  $d_6$ -DMSO)  $\delta$  9.18 (s, 1H), 7.72-7.77  
25

(M, 3H), 7.42 (d,  $J = 7.6$  Hz, 2H), 7.16-7.21 (m, 4H), 7.10 (d,  $J = 8.0$  Hz, 1H), 7.02 (d,  $J = 2.0$  Hz, 1H), 6.79 (dd,  $J = 8.4$  and  $2.0$  Hz, 1H), 5.58 (d,  $J = 5.6$  Hz, 1H), 5.12 (m, 1H), 4.31 (s, 2H), 3.58 (s, 3H), 3.38 (s, 3H), 2.82 (s, 3H), 1.50 (d,  $J = 6.8$  Hz, 3H). MS (ESI)  $m/z = 542$   $[M+H]^+$ .

5

#### Example 41

*[4-(4-{Methyl-[1-methyl-2-(1-phenyl-ethylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide hydrochloride*



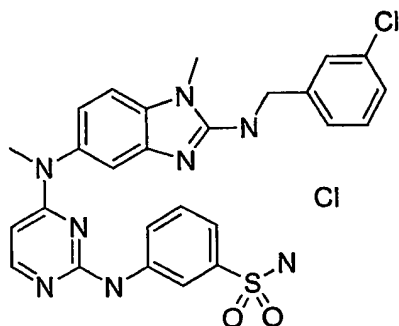
10

The title compound was prepared following the procedure of example two with  $N^5$ -(2-Chloro-pyrimidin-4-yl)-1,  $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine (98 mg, 0.25 mmol) and (4-amino-phenyl)-methanesulfonamide (46 mg, 0.25 mmol) as a white solid (90 mg, 62%).  $^1\text{H}$  NMR (400 MHz,  $d_6$ -DMSO)  $\delta$  9.13 (s, 1H), 7.71-7.75 (m, 3H), 7.42 (d,  $J = 7.6$  Hz, 2H), 7.26-7.30 (M, 2H), 7.16-7.19 (m, 4H), 7.11 (d,  $J = 8.0$  Hz, 1H), 7.02 (d,  $J = 2.0$  Hz, 1H), 6.79 (dd,  $J = 8.4$  and  $2.0$  Hz, 1H), 6.73 (s, 2H), 5.56 (d,  $J = 6.0$  Hz, 1H), 5.12 (m, 1H), 4.12 (s, 2H), 3.58 (s, 3H), 3.38 (s, 3H), 1.50 (d,  $J = 7.2$  Hz, 3H). MS (ESI)  $m/z = 543$   $[M+H]^+$ .

15

#### Example 42

*3-(4-{[2-(3-Chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide hydrochloride*

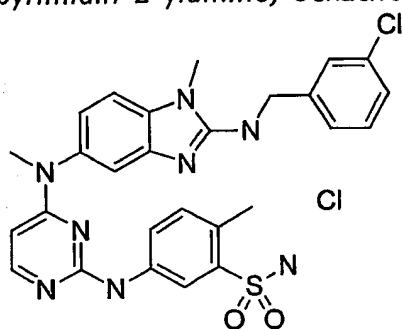


20

The title compound was prepared following the procedure of example one with N<sup>2</sup>-(3-Chloro-benzyl)-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (50 mg, 0.12 mmol) and 3-amino-benzenesulfonamide (21 mg, 0.12 mmol) as a white solid (31 mg, 44%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.51 (s, 1H), 8.60 (s, 1H), 7.76-7.80 (M, 2H), 7.25-7.47 (m, 10H), 7.13 (s, 1H), 6.90 (d, J = 7.8 Hz, 1H), 5.64 (d, J = 6.0 Hz, 1H), 4.62 (d, J = 5.4 Hz, 2H), 3.61 (s, 3H), 3.45 (s, 3H). MS (ESI) m/z = 549 [M+H]<sup>+</sup>.

### Example 43

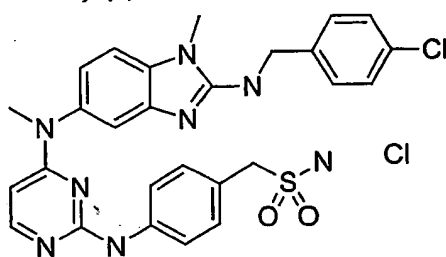
3-(4-{[2-(3-Chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide hydrochloride



The title compound was prepared following the procedure of example one with N<sup>2</sup>-(3-Chloro-benzyl)-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (50 mg, 0.12 mmol) and 5-amino-2-methyl-benzenesulfonamide (22 mg, 0.12 mmol) as a white solid (42 mg, 58%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.79 (s, 1H), 8.54 (s, 1H), 7.81-7.84 (M, 1H), 7.66-7.69 (m, 1H), 7.11-7.56 (m, 11H), 5.69 (d, J = 6.0 Hz, 1H), 4.72 (d, J = 5.4 Hz, 2H), 3.70 (s, 3H), 3.48 (s, 3H), 2.51 (s, 3H). MS (ESI) m/z = 563 [M+H]<sup>+</sup>.

### Example 44

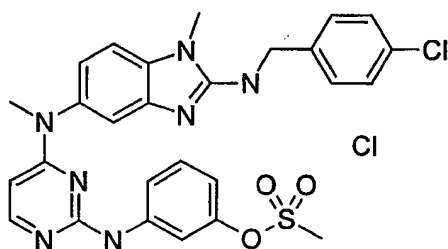
[4-(4-{[2-(4-Chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide hydrochloride



The title compound was prepared following the procedure of example one with N<sup>2</sup>-(4-Chloro-benzyl)-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (103 mg, 0.25 mmol) and (4-amino-phenyl)-methanesulfonamide (46 mg, 0.25 mmol) as a white solid (90 mg, 60%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.31 (s, 1H), 8.05 (br s, 1H), 7.72-7.80 (m, 3H), 7.46 (d, J = 8.4 Hz, 2H), 7.38 (d, J = 8.4 Hz, 2H), 7.32 (d, J = 8.4 Hz, 1H), 7.20 (d, J = 8.4 Hz, 2H), 7.14 (s, 1H), 6.93 (d, J = 8.4 Hz, 1H), 6.78 (s, 2H), 5.66 (d, J = 6.0 Hz, 1H), 4.62 (d, J = 5.4 Hz, 2H), 4.17 (s, 2H), 3.63 (s, 3H), 3.44 (s, 3H). MS (ESI) m/z = 563 [M+H]<sup>+</sup>.

#### Example 45

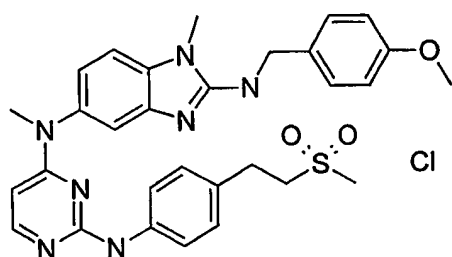
*Methanesulfonic acid 3-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl ester hydrochloride*



The title compound was prepared following the procedure of example one with N<sup>2</sup>-(4-Chloro-benzyl)-N<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (103 mg, 0.25 mmol) and methanesulfonic acid 3-amino-phenyl ester (56 mg, 0.25 mmol) as a white solid (87 mg, 58%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.40 (s, 1H), 8.00 (s, 1H), 7.79 (d, J = 6.0 Hz, 1H), 7.64 (d, J = 8.1 Hz, 1H), 7.50 (t, J = 5.7 Hz, 1H), 7.36-7.44 (m, 4H), 7.23-7.29 (m, 2H), 7.08 (s, 1H), 6.84 (d, J = 8.1 Hz, 2H), 5.65 (d, J = 5.7 Hz, 1H), 4.58 (d, J = 5.7 Hz, 2H), 3.58 (s, 3H), 3.43 (s, 3H), 3.34 (s, 3H). MS (ESI) m/z = 564 [M+H]<sup>+</sup>.

#### Example 46

*N<sup>5</sup>-(2-[4-(2-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl)-N<sup>2</sup>-(4-methoxy-benzyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine hydrochloride*

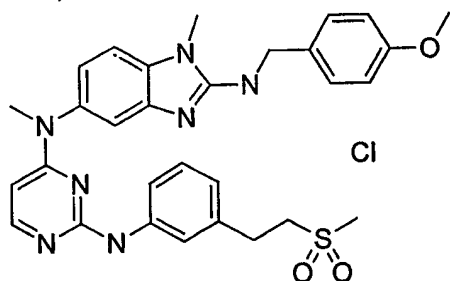


The title compound was prepared following the procedure of example two with  $N^5$ -(2-chloro-pyrimidin-4-yl)- $N^2$ -(4-methoxy-benzyl)-1, $N^5$ -dimethyl-1H-benzimidazole-2,5-diamine (82 mg, 0.20 mmol) and 4-(2-Methanesulfonyl-ethyl)-phenylamine (40 mg, 0.20 mmol) as a white solid (57 mg, 47%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  9.28 (s, 1H), 7.78 (d,  $J$  = 6.0 Hz, 1H), 7.67 (d,  $J$  = 8.4 Hz, 2H), 7.34-7.38 (m, 3H), 7.13-7.18 (m, 3H), 6.94 (d,  $J$  = 8.4 Hz, 1H), 6.89 (d,  $J$  = 8.7 Hz, 2H), 5.66 (d,  $J$  = 6.0 Hz, 1H), 4.57 (d,  $J$  = 5.4 Hz, 2H), 3.72 (s, 3H), 3.62 (s, 3H), 3.43 (s, 3H), 3.35-3.43 (m, 2H), 2.96 (s, 3H), 2.90-2.96 (m, 2H). MS (ESI)  $m/z$  = 572  $[\text{M}+\text{H}]^+$ .

10

#### Example 47

$N^5$ -{2-[3-(2-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxy-benzyl)-1, $N^5$ -dimethyl-1H-benzimidazole-2,5-diamine hydrochloride

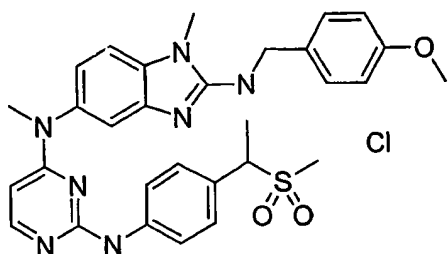


The title compound was prepared following the procedure of example two with  $N^5$ -(2-chloro-pyrimidin-4-yl)- $N^2$ -(4-methoxy-benzyl)-1, $N^5$ -dimethyl-1H-benzimidazole-2,5-diamine (82 mg, 0.20 mmol) and 3-(2-Methanesulfonyl-ethyl)-phenylamine (40 mg, 0.20 mmol) as a white solid (69 mg, 57%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  9.08 (s, 1H), 7.76 (d,  $J$  = 6.0 Hz, 2H), 7.59 (d,  $J$  = 8.4 Hz, 1H), 7.28-7.34 (m, 3H), 7.08-7.23 (m, 3H), 6.79-6.89 (m, 4H), 5.61 (d,  $J$  = 5.7 Hz, 1H), 4.52 (d,  $J$  = 5.7 Hz, 2H), 3.72 (s, 3H), 3.55 (s, 3H), 3.43 (s, 3H), 3.35-3.40 (m, 2H), 2.97 (s, 3H), 2.90-2.94 (m, 2H). MS (ESI)  $m/z$  = 572  $[\text{M}+\text{H}]^+$ .

20

#### Example 48

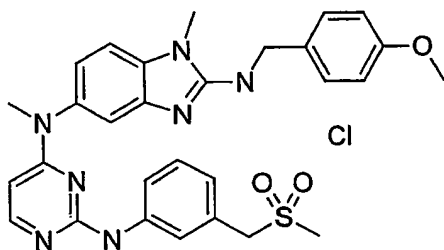
*N*<sup>5</sup>-{2-[4-(1-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-*N*<sup>2</sup>-(4-methoxy-benzyl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine hydrochloride



The title compound was prepared following the procedure of example two with *N*<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(4-methoxy-benzyl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine (82 mg, 0.20 mmol) and 4-(1-Methanesulfonyl-ethyl)-phenylamine (47 mg, 0.20 mmol) as a white solid (49 mg, 40%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.24 (s, 1H), 7.75-7.80 (M, 3H), 7.60 (br s, 1H), 7.34 (d, *J* = 8.7 Hz, 2H), 7.26 (d, *J* = 7.8 Hz, 3H), 7.12 (s, 1H), 6.89 (d, *J* = 8.4 Hz, 3H), 5.66 (d, *J* = 6.0 Hz, 1H), 4.53 (d, *J* = 5.7 Hz, 2H), 4.40 (m, 1H), 3.72 (s, 3H), 3.58 (s, 3H), 3.43 (s, 3H), 2.76 (s, 3H), 1.59 (d, *J* = 7.2 Hz, 3H). MS (ESI) *m/z* = 572 [*M*+*H*]<sup>+</sup>.

#### Example 49

*N*<sup>5</sup>-[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>2</sup>-(4-methoxy-benzyl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine hydrochloride

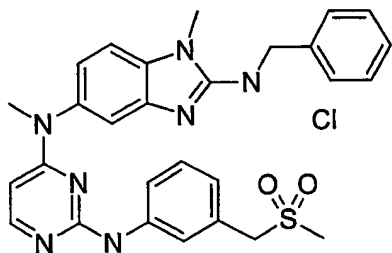


The title compound was prepared following the procedure of example two with *N*<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(4-methoxy-benzyl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine (82 mg, 0.20 mmol) and methanesulfonylmethyl-phenylamine (37 mg, 0.20 mmol) as a white solid (105 mg, 88%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.19 (s, 1H), 7.90 (s, 1H), 7.77 (d, *J* = 6.0 Hz, 1H), 7.69 (d, *J* = 8.4 Hz, 1H), 7.28-7.34 (m, 3H), 7.19-7.24 (m, 2H), 7.09 (d, *J* = 1.8 Hz, 1H), 6.81-6.92 (m, 4H), 5.64 (d, *J* = 6.0 Hz, 1H), 4.52 (d, *J* = 5.7 Hz, 2H), 4.32 (s, 2H), 3.72 (s, 3H), 3.55 (s, 3H), 3.43 (s, 3H), 2.88 (s, 3H). MS (ESI) *m/z* = 558 [*M*+*H*]<sup>+</sup>.



## Example 50

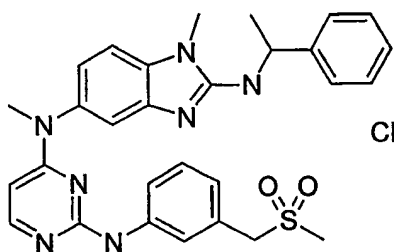
*N*<sup>2</sup>-Benzyl-*N*<sup>5</sup>-[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine hydrochloride



- 5 The title compound was prepared following the procedure of Example two with *N*<sup>2</sup>-benzyl-*N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>5</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine (95 mg, 0.25 mmol) and methanesulfonylmethyl-phenylamine (46 mg, 0.25 mmol) to give the desired product as an off-white solid (121 mg, 86%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.26 (s, 1H), 7.87 (s, 1H), 7.78 (d, *J* = 6.0 Hz, 1H), 7.67 (d, *J* = 8.4 Hz, 1H), 7.42 (m, 1H), 7.21-7.40 (m, 7H), 7.12 (s, 1H), 6.88-6.93 (M, 2H), 5.66 (d, *J* = 5.7 Hz, 1H), 4.62 (d, *J* = 5.4 Hz, 2H), 4.32 (s, 2H), 3.60 (s, 3H), 3.43 (s, 3H), 2.88 (s, 3H). MS (ESI) *m/z* = 528 [M+H]<sup>+</sup>.

## Example 51

- 15 *N*<sup>5</sup>-[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(1-phenyl-ethyl)-1*H*-benzimidazole-2,5-diamine hydrochloride

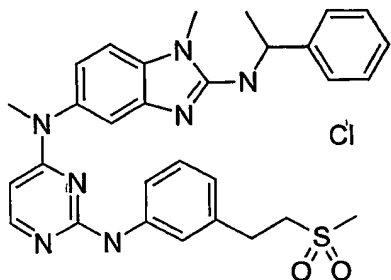


- 20 The title compound was prepared following the procedure of example two with *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(1-phenyl-ethyl)-1*H*-benzimidazole-2,5-diamine (98 mg, 0.25 mmol) and methanesulfonylmethyl-phenylamine (46 mg, 0.25 mmol) as a white solid (90 mg, 62%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.19 (s, 1H), 7.88 (s, 1H), 7.75 (d, *J* = 6.0 Hz, 1H), 7.68 (d, *J* = 8.1 Hz, 1H), 7.45 (d, *J* = 7.5 Hz, 2H), 7.29-7.34 (m, 2H), 7.16-7.23 (m, 4H), 7.05 (d, *J* = 1.8 Hz, 1H), 6.90 (d, *J* = 7.5 Hz, 1H),

5.62 (dd,  $J = 8.1$  and  $1.8$  Hz, 1H), 5.62 (d,  $J = 6.0$  Hz, 1H), 5.15 (m, 1H), 4.31 (s, 2H), 3.61 (s, 3H), 3.41 (s, 3H), 2.87 (s, 3H), 1.53 (d,  $J = 6.9$  Hz, 3H). MS (ESI)  $m/z = 542$   $[M+H]^+$ .

### Example 52

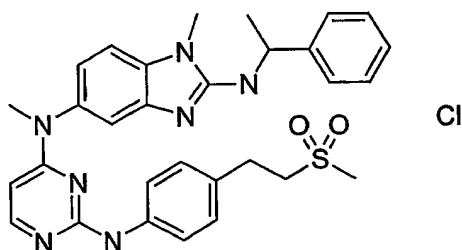
- 5  $N^5$ -{2-[3-(2-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1, $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzimidazole-2,5-diamine hydrochloride



- The title compound was prepared following the procedure of example two with  $N^5$ -(2-Chloro-pyrimidin-4-yl)-1, $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzimidazole-2,5-diamine (98 mg, 0.25 mmol) and 3-(2-methanesulfonyl-ethyl)-phenylamine (50 mg, 0.25 mmol) as a white solid (48 mg, 32%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  9.08 (s, 1H), 7.73-7.77 (m, 2H), 7.58 (d,  $J = 8.4$  Hz, 1H), 7.44 (d,  $J = 7.5$  Hz, 2H), 7.29-7.34 (m, 2H), 7.12-7.23 (m, 4H), 7.05 (d,  $J = 1.5$  Hz, 1H), 6.79-6.84 (m, 2H), 5.59 (d,  $J = 5.7$  Hz, 1H), 5.14 (m, 1H), 3.60 (s, 3H), 3.41 (s, 3H), 3.32-3.41 (m, 2H), 2.90-2.96 (m, 5H), 1.53 (d,  $J = 6.9$  Hz, 3H). MS (ESI)  $m/z = 556$   $[M+H]^+$ .

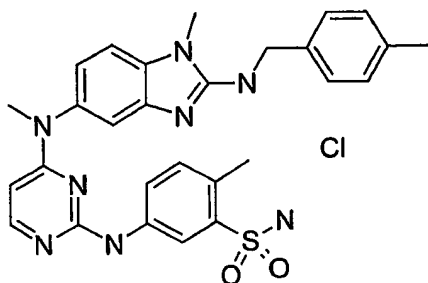
### Example 53

- 20  $N^5$ -{2-[4-(2-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1, $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzimidazole-2,5-diamine hydrochloride

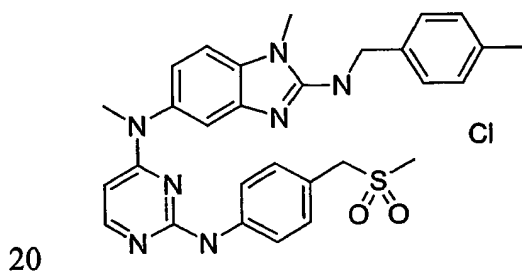


- The title compound was prepared following the procedure of example two with  $N^5$ -(2-Chloro-pyrimidin-4-yl)-1, $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzimidazole-2,5-diamine (98 mg, 0.25 mmol) and 4-(2-methanesulfonyl-ethyl)-phenylamine (50 mg, 0.25 mmol) as a white solid (81 mg, 55%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  10.09 (s,

**2-Methyl-5-(4-{methyl-[1-methyl-2-(4-methyl-benzylamino)-1H-benzimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide hydrochloride**



*N*<sup>5</sup>-[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(4-methyl-benzyl)-1*H*-benzoimidazole-2,5-diamine hydrochloride

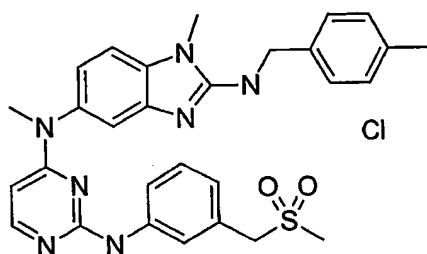


The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-N<sup>2</sup>-(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine (98 mg, 0.25 mmol) and 4-[(methylsulfonyl)methyl]aniline (46 mg, 0.25 mmol) as a white solid (141 mg, 97%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.21 (s,

1H), 7.76-7.79 (M, 3H), 7.50 (br s, 1H), 7.22-7.30 (m, 5H), 7.09-7.14 (M, 3H), 6.86 (d, J = 8.4 Hz, 1H), 5.64 (d, J = 6.0 Hz, 1H), 4.55 (d, J = 5.4 Hz, 2H), 4.34 (s, 2H), 3.58 (s, 3H), 3.43 (s, 3H), 2.85 (s, 3H), 2.26 (s, 3H). MS (ESI) m/z = 542 [M+H]

### Example 56

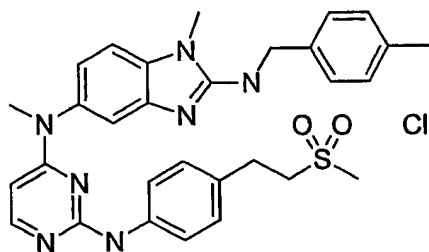
- 5 *N*<sup>5</sup>-[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(4-methyl-benzyl)-1*H*-benzimidazole-2,5-diamine



- The title compound was prepared following the procedure of example one with *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(4-methyl-benzyl)-1*H*-benzimidazole-2,5-diamine (98 mg, 0.25 mmol) and methanesulfonylmethyl-phenylamine (46 mg, 0.25 mmol) as a white solid (142 mg, 97%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.18 (s, 1H), 7.89 (s, 1H), 7.77 (d, J = 6.0 Hz, 1H), 7.68 (d, J = 8.1 Hz, 1H), 7.36 (t, J = 6.0 Hz, 1H), 7.19-7.29 (M, 4H), 7.07-7.13 (M, 3H), 6.91 (d, J = 7.5 Hz, 1H), 6.83 (dd, J = 8.1 and 1.8 Hz, 1H), 5.64 (d, J = 6.0 Hz, 1H), 4.54 (d, J = 5.4 Hz, 2H), 4.32-4.35 (m, 2H), 3.57 (s, 3H), 3.42 (s, 3H), 2.88 (s, 3H), 2.26 (s, 3H). MS (ESI) m/z = 542 [M+H].

### Example 57

- N*<sup>5</sup>-{2-[4-(2-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(4-methyl-benzyl)-1*H*-benzimidazole-2,5-diamine hydrochloride

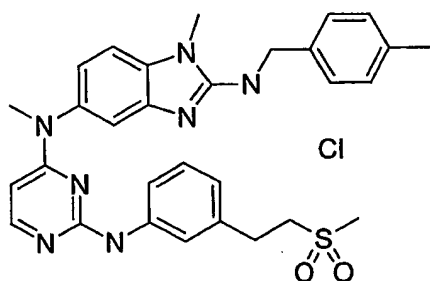


- 20 The title compound was prepared following the procedure of example one with *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(4-methyl-benzyl)-1*H*-benzimidazole-2,5-

diamine (98 mg, 0.25 mmol) and 4-(2-methanesulfonyl-ethyl)-phenylamine (50 mg, 0.25 mmol) as a white solid (104 mg, 70%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.05 (s, 1H), 7.70-7.75 (m, 3H), 7.36 (t, J = 5.7 Hz, 1H), 7.20-7.29 (m, 3H), 7.07-7.14 (M, 5H), 6.82 (dd, J = 8.1 and 1.5 H, 1H), 5.60 (d, J = 5.7 Hz, 1H), 4.54 (d, J = 5.4 Hz, 2H), 3.57 (s, 3H), 3.42 (s, 3H), 3.30-3.37 (M, 2H), 2.90-2.95 (m, 5H), 2.26 (s, 3H). MS (ESI) m/z = 556 [M+H].

### Example 58

*N<sup>5</sup>-{2-[3-(2-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,N<sup>5</sup>-dimethyl-N<sup>2</sup>-(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine hydrochloride*



10

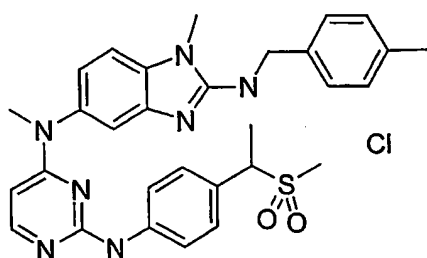
The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-N<sup>2</sup>-(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine (98 mg, 0.25 mmol) and 3-(2-methanesulfonyl-ethyl)-phenylamine (50 mg, 0.25 mmol) as a white solid (126 mg, 85%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.07 (s, 1H), 7.75-7.77 (m, 2H), 7.59 (d, J = 8.1 Hz, 1H), 7.36 (t, J = 6.0 Hz, 1H), 7.07-7.29 (M, 7H), 6.79-6.85 (M, 2H), 5.61 (d, J = 5.7 Hz, 1H), 4.54 (d, J = 5.7 Hz, 2H), 3.57 (s, 3H), 3.43 (s, 3H), 3.32-3.40 (m, 2H), 2.97 (s, 3H), 2.90-2.97 (M, 2H), 2.26 (s, 3H). MS (ESI) m/z = 556 [M+H].

15

### Example 59

*N<sup>5</sup>-{2-[4-(1-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,N<sup>5</sup>-dimethyl-N<sup>2</sup>-(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine hydrochloride*

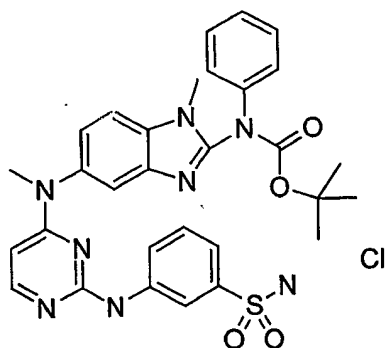
20



The title compound was prepared following the procedure of example one with N<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1,N<sup>5</sup>-dimethyl-N<sup>2</sup>-(4-methyl-benzyl)-1H-benzimidazole-2,5-diamine (98 mg, 0.25 mmol) and 4-(1-methanesulfonyl-ethyl)-phenylamine (50 mg, 0.25 mmol) as a white solid (151 mg, 97%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.20 (s, 1H), 7.76–7.79 (M, 3H), 7.38 (m, 1H), 7.21–7.29 (m, 5H), 7.08–7.13 (M, 3H), 6.83 (d, J = 8.1 Hz, 1H), 5.64 (d, J = 6.0 Hz, 1H), 4.54 (d, J = 5.1 Hz, 2H), 4.39 (m, 1H), 3.57 (s, 3H), 3.43 (S, 3H), 2.76 (s, 3H), 2.26 (s, 3H), 1.59 (d, J = 7.2 Hz, 3H).

#### 10 Example 60

*(1-Methyl-5-{methyl-[2-(3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzimidazol-2-yl)-phenyl-carbamic acid tert-butyl ester hydrochloride*

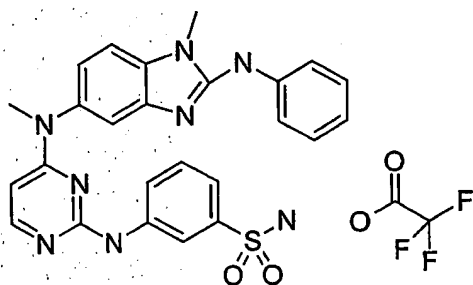


15

To a solution of {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzimidazol-2-yl}-phenyl-carbamic acid tert-butyl ester (100 mg, 0.22 mmol) and 3-amino-benzenesulfonamide (38 mg, 0.22 mmol) in ethanol was added HCl (1 drop, 1M in diethyl ether), and the reaction was heated to 70 °C. After 20 h, the reaction was filtered to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 10.15 (s, 1H), 8.44 (s, 1H), 7.84 (d, J = 6.6 Hz, 1H), 7.72 (d, J = 8.4 Hz, 2H), 7.61 (s, 1H), 7.27–7.39 (m, 10H), 5.79 (d, J = 5.1 Hz, 1H), 3.78 (s, 3H), 3.51 (s, 3H), 1.41 (s, 9H). MS (ESI) m/z = 601 [M+H]<sup>+</sup>.

## Example 61

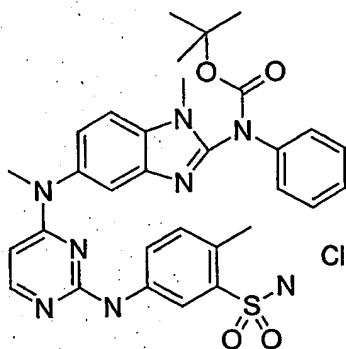
3-{4-[Methyl-(1-methyl-2-phenylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide trifluoroacetic acid



- 5 (1-Methyl-5-{methyl-[2-(3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-phenyl-carbamic acid tert-butyl ester hydrochloride was stirred in solution of 50% trifluoroacetic acid and methylene chloride and concentrated to give the title compound as a white solid.  $^1\text{H}$  NMR (300 MHz,  $\text{d}_6\text{-DMSO} + \text{NaHCO}_3$ )  $\delta$  10.32 (br s, 1H), 9.54 (br s, 1H), 8.49 (s, 1H), 7.86 (d,  $J = 6.9$  Hz, 1H), 7.73-7.78 (m, 3H), 7.47-7.54 (m, 3H), 7.34-7.41 (m, 4H), 7.06-7.14 (m, 2H), 5.80 (d,  $J = 6.6$  Hz, 1H), 3.78 (s, 3H), 3.53 (s, 3H). MS (ESI)  $m/z = 501$   $[\text{M}+\text{H}]^+$ .
- 10

## Example 62

- 15 (1-Methyl-5-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-phenyl-carbamic acid tert-butyl ester hydrochloride

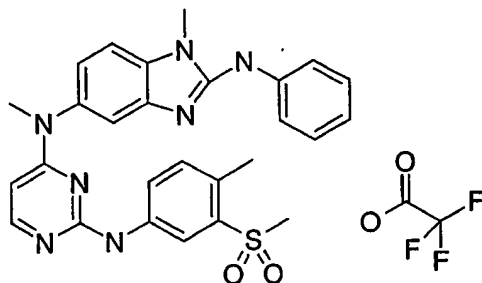


- The title compound was prepared following the procedure of example 60 using {5-[[2-Chloro-pyrimidin-4-yl]-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-phenyl-carbamic acid tert-butyl ester (100 mg, 0.22 mmol) and 5-amino-2-methyl-benzenesulfonamide (41 mg, 0.22 mmol) to give the desired product as a white solid.
- 20  $^1\text{H}$  NMR (300 MHz,  $\text{d}_6\text{-DMSO} + \text{NaHCO}_3$ )  $\delta$  9.48 (s, 1H), 8.54 (s, 1H), 7.79 (d,  $J = 6.3$  Hz, 1H), 7.66-7.71 (m, 2H), 7.56 (d,  $J = 1.5$  Hz, 1H), 7.38 (m, 4H), 7.23-7.29 (m, 4H), 7.12

(m, 1H), 5.68 (d,  $J = 6.0$  Hz, 1H), 3.78 (s, 3H), 3.48 (s, 3H), 2.49 (s, 3H), 1.42 (s, 9H). MS (ESI)  $m/z = 615$   $[M+H]^+$ .

### Example 63

- 5 *N<sup>5</sup>*-[2-(3-Methanesulfonyl-4-methyl-phenylamino)-pyrimidin-4-yl]-1,*N<sup>5</sup>*-dimethyl-*N<sup>2</sup>*-phenyl-1H-benzoimidazole-2,5-diamine trifluoroacetic acid

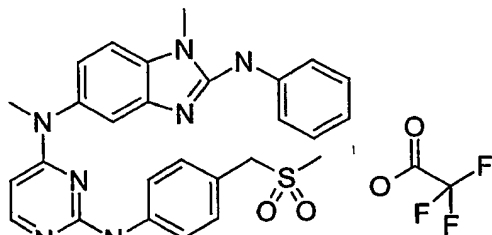


- (1-Methyl-5-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-phenyl-carbamic acid tert-butyl ester hydrochloride was deprotected according to the procedure of example 61 to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz,  $d_6$ -DMSO +  $NaHCO_3$ )  $\delta$  10.52 (br s, 1H), 9.55 (br s, 1H), 8.45 (s, 1H), 7.83 (d,  $J = 6.9$  Hz, 1H), 7.76 (d,  $J = 8.1$  Hz, 2H), 7.64 (dd,  $J = 8.1$  and 1.5 Hz, 1H), 7.53 (d,  $J = 8.7$  Hz, 1H), 7.29–7.40 (m, 5H), 7.04–7.14 (m, 2H), 5.80 (d,  $J = 6.3$  Hz, 1H), 3.77 (s, 3H), 3.54 (s, 3H), 2.54 (s, 3H). MS (ESI)  $m/z = 515$   $[M+H]^+$ .

15

### Example 64

*N<sup>5</sup>*-[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N<sup>5</sup>*-dimethyl-*N<sup>2</sup>*-phenyl-1H-benzoimidazole-2,5-diamine trifluoroacetic acid



20

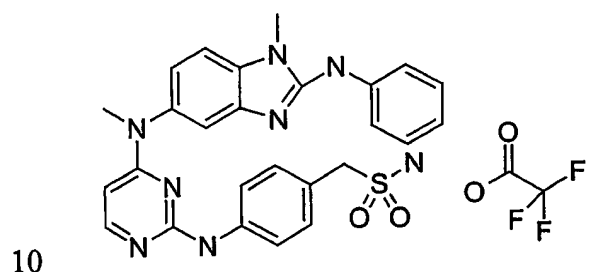
The title compound was prepared following the procedure of example 5 using {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-phenyl-carbamic acid tert-butyl ester (100 mg, 0.22 mmol) and 4-[(methanesulfonyl)methyl]aniline



(41 mg, 0.22 mmol) to give the desired product as a white solid (116 mg, 84%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO +  $\text{NaHCO}_3$ )  $\delta$  10.55 (s, 1H), 9.83 (br s, 1H), 7.87 (d,  $J$  = 6.9 Hz, 1H), 7.70 (d,  $J$  = 8.1 Hz, 2H), 7.57–7.60 (m, 3H), 7.32–7.44 (M, 5H), 7.11–7.21 (M, 2H), 5.93 (br s, 1H), 4.43 (s, 2H), 3.79 (s, 3H), 3.53 (s, 3H), 2.87 (s, 3H). MS (ESI)  $m/z$  = 514  $[\text{M}+\text{H}]^+$ .

### Example 65

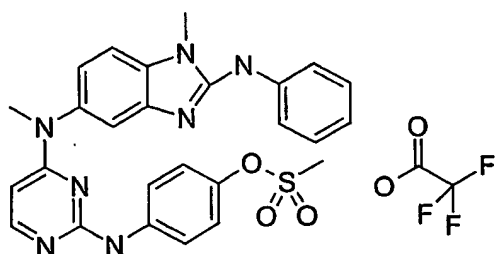
(4-{4-[Methyl-(1-methyl-2-phenylamino-1H-benzimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide trifluoroacetic acid



The title compound was prepared following the procedure of example 5 using {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-phenyl-carbamic acid tert-butyl ester (100 mg, 0.22 mmol) and (4-amino-phenyl)-methanesulfonamide (39 mg, 0.22 mmol) to give the desired product as a white solid (53 mg, 40%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.47 (s, 1H), 9.10 (s, 1H), 7.73-7.87 (m, 5H), 7.41 (d, J = 8.4 Hz, 1H), 7.30-7.36 (m, 3H), 7.23 (d, J = 8.4 Hz, 1H), 6.95-7.03 (m, 2H), 6.78 (s, 2H), 5.71 (d, J = 6.0 Hz, 1H), 4.18 (s, 2H), 3.76 (s, 3H), 3.49 (s, 3H). MS (ESI) m/z = 515 [M+H]<sup>+</sup>.

## 20 Example 66

*Methanesulfonic acid 4-{4-[methyl-(1-methyl-2-phenylamino-1H-benzimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl ester trifluoroacetic acid*

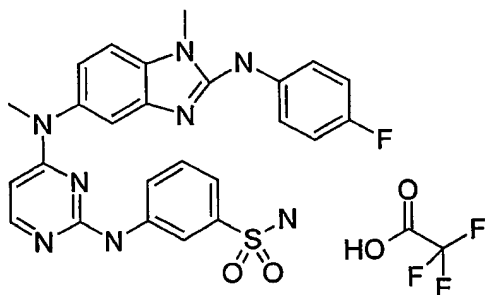


25 The title compound was prepared following the procedure of example 5 using {5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-phenyl-

carbamic acid tert-butyl ester (100 mg, 0.22 mmol) and sulfamic acid 4-amino-phenyl ester (39 mg, 0.22 mmol) to give the desired product as a white solid (86 mg, 65%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.32 (s, 1H), 9.02 (s, 1H), 7.80-7.88 (m, 5H), 7.30-7.41 (M, 4H), 7.18 (d, J = 8.7 Hz, 2H), 6.93-7.01 (m, 2H), 5.71 (d, J = 6.0 Hz, 1H), 3.76 (s, 3H), 3.47 (s, 3H), 3.30 (s, 3H). MS (ESI) m/z = 516 [M+H]<sup>+</sup>.

### Example 67

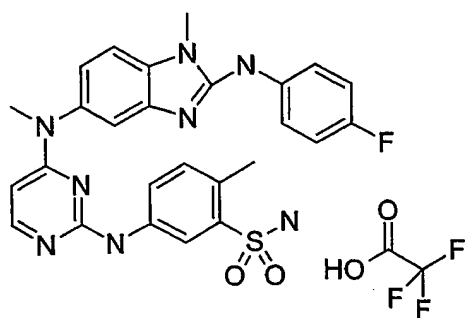
*3-(4-{[2-(4-Fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide trifluoroacetic acid*



The title compound was prepared following the procedure of example 5 using {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-(4-fluorophenyl)-carbamic acid tert-butyl ester (120 mg, 0.25 mmol) and 3-amino-benzenesulfonamide (43 mg, 0.25 mmol) to give the desired product as a white solid (76 mg, 48%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.80 (br s, 1H), 9.21 (br s, 1H), 8.57 (s, 1H), 7.76-7.89 (m, 4H), 7.38-7.45 (m, 3H), 7.29-7.33 (M, 3H), 7.13-7.22 (M, 2H), 7.01-7.05 (M, 1H), 5.71 (d, J = 6.0 Hz, 1H), 3.75 (s, 3H), 3.50 (s, 3H). MS (ESI) m/z = 519 [M+H]<sup>+</sup>.

### Example 68

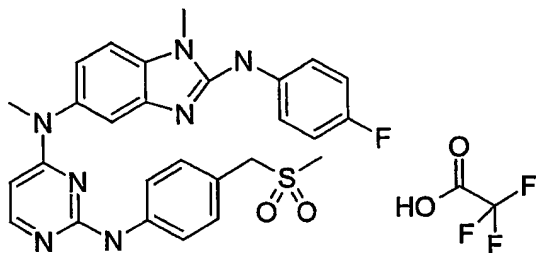
*5-(4-{[2-(4-Fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide trifluoroacetic acid*



The title compound was prepared following the procedure of example 5 using {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-(4-fluoro-phenyl)-carbamic acid tert-butyl ester (120 mg, 0.25 mmol) and 5-amino-2-methyl-benzenesulfonamide (46 mg, 0.25 mmol) to give the desired product as a white solid (150 mg, 93%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 10.28 (br s, 1H), 9.36 (br s, 1H), 8.51 (s, 1H), 7.80-7.87 (m, 3H), 7.66 (dd, J = 8.4 and 2.1 Hz, 1H), 7.48 (d, J = 8.4 Hz, 1H), 7.27-7.37 (m, 4H), 7.17-7.23 (M, 2H), 7.08 (dd, J = 8.2 and 1.8 Hz, 1H), 5.76 (d, J = 6.3 Hz, 1H), 3.76 (s, 3H), 2.54 (s, 3H). MS (ESI) m/z = 533 [M+H]<sup>+</sup>.

### 10 Example 69

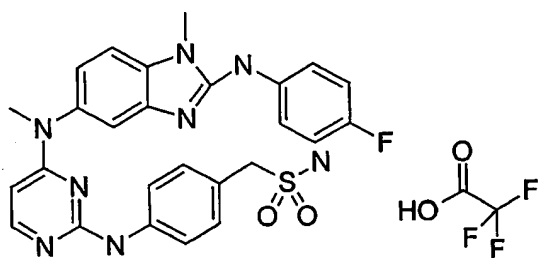
*N*<sup>2</sup>-(4-Fluoro-phenyl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine trifluoroacetic acid



The title compound was prepared following the procedure of example 5 using {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-(4-fluoro-phenyl)-carbamic acid tert-butyl ester (100 mg, 0.21 mmol) and 4-(methanesulfonylmethyl)aniline (39 mg, 0.21 mmol) to give the desired product as a white solid (109 mg, 81%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.81 (br s, 1H), 9.23 (br s, 1H), 7.81-7.88 (M, 3H), 7.72 (d, J = 8.1 Hz, 2H), 7.44 (d, J = 8.4 Hz, 1H), 7.28-7.34 (m, 3H), 7.16-7.22 (M, 2H), 7.05 (dd, J = 8.2 and 1.6 Hz, 1H), 5.78 (d, J = 6.0 Hz, 1H), 4.39 (s, 2H), 3.75 (s, 3H), 3.50 (s, 3H), 2.86 (s, 3H). MS (ESI) m/z = 532 [M+H]<sup>+</sup>.

### Example 70

*[4-(4-{[2-(4-Fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide trifluoroacetic acid*

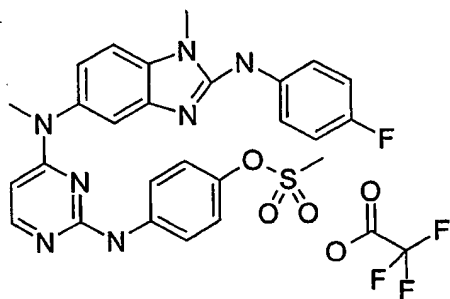


The title compound was prepared following the procedure of example 5 using {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzimidazol-2-yl}-(4-fluorophenyl)-methanesulfonamide (39 mg, 0.21 mmol) to give the desired product as a yellow solid (89 mg, 65%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.54 (br s, 1H), 9.16 (br s, 1H), 7.72-7.90 (m, 5H), 7.41 (d, J = 8.4 Hz, 1H), 7.32 (s, 2H), 7.14-7.25 (M, 4H), 7.01 (d, J = 8.1 Hz, 1H), 6.78 (s, 2H), 5.71 (d, J = 6.0 Hz, 1H), 4.18 (s, 2H), 3.75 (s, 3H), 3.49 (s, 3H). MS (ESI) m/z = 533 [M+H]<sup>+</sup>.

10

### Example 71

*Methanesulfonic acid 4-(4-{[2-(4-fluorophenylamino)-1-methyl-1H-benzimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl ester trifluoroacetic acid*

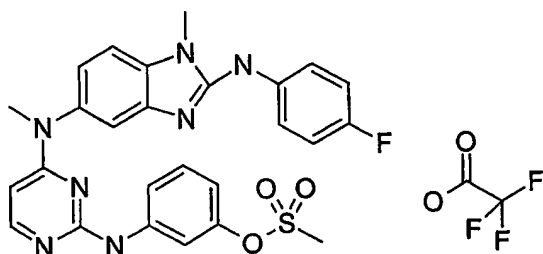


The title compound was prepared following the procedure of example 5 using {5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzimidazol-2-yl}-(4-fluorophenyl)-carbamic acid tert-butyl ester (96 mg, 0.20 mmol) and sulfamic acid 4-amino-phenyl ester (37 mg, 0.19 mmol) to give the desired product as a yellow solid (66 mg, 51%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.33 (s, 1H), 9.10 (s, 1H), 7.80-7.92 (M, 5H), 7.39 (d, J = 8.4 Hz, 1H), 7.30 (s, 1H), 7.14-7.20 (M, 4H), 6.99 (dd, J = 8.4 and 1.6 Hz, 1H), 5.71 (d, J = 6.0 Hz, 2H), 3.74 (s, 3H), 3.47 (s, 3H), 2.50 (s, 3H). MS (ESI) m/z = 534 [M+H]<sup>+</sup>.

20

### Example 72

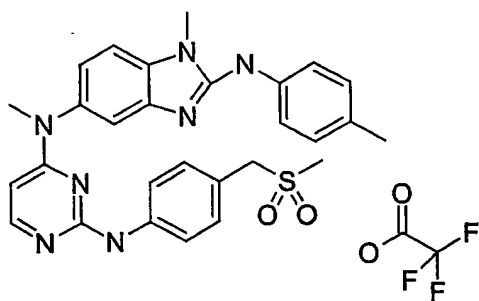
*Methanesulfonic acid 3-(4-{[2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl ester trifluoroacetic acid*



- 5 The title compound was prepared following the procedure of example 5 using {5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-(4-fluoro-phenyl)-carbamic acid tert-butyl ester (92 mg, 0.19 mmol) and Methanesulfonic acid 3-amino-phenylester hydrochloride (42 mg, 0.19 mmol) to give the desired product as a yellow solid (73 mg, 59%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.46 (s, 1H),
- 10 9.10 (s, 1H), 8.00 (m, 1H), 7.87-7.91 (m, 2H), 7.82 (d, J = 6.0 Hz, 1H), 7.64 (d, J = 8.4 Hz, 1H), 7.40 (d, J = 8.1 Hz, 1H), 7.27-7.33 (m, 2H), 7.14-7.20 (m, 2H), 7.00 (dd, J = 8.2 and 1.6 Hz, 1H), 6.85 (dd, J = 8.1 and 2.1 Hz, 1H), 5.71 (d, J = 6.0 Hz, 1H), 3.74 (s, 3H), 3.47 (s, 3H), 3.34 (s, 3H). MS (ESI) m/z = 534 [M+H]<sup>+</sup>.

### 15 Example 73

*N<sup>5</sup>-[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,N<sup>5</sup>-dimethyl-N<sup>2</sup>-p-tolyl-1H-benzoimidazole-2,5-diamine trifluoroacetic acid*

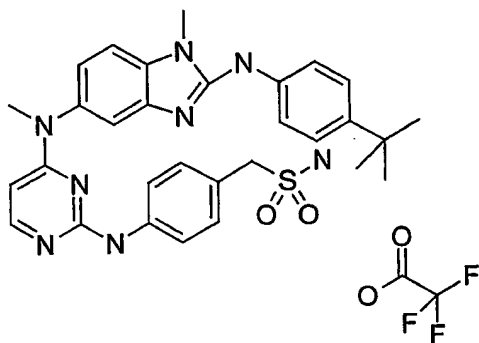


- The title compound was prepared following the procedure of example 5 using {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-p-tolyl-
- 20 carbamic acid tert-butyl ester (66 mg, 0.14 mmol) and 4-(methanesulfonylmethyl)aniline (26 mg, 0.14 mmol) to give the desired product as a white solid (32 mg, 36%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.26 (s, 1H), 8.92 (s, 1H), 7.73-7.81 (M, 5H), 7.37 (d, J = 8.4 Hz, 1H), 7.29 (d, J = 1.5 Hz, 1H), 7.24 (d, J =
- 25 8.4 Hz, 2H), 7.13 (d, J = 8.4 Hz, 2H), 6.98 (dd, J = 8.4 and 1.5 Hz, 1H), 5.69 (d, J = 6.0

Hz, 1H), 4.35 (s, 2H), 3.74 (s, 3H), 3.47 (s, 3H), 2.85 (s, 3H), 2.26 (s, 3H). MS (ESI)  $m/z$  = 534  $[M+H]^+$ .

### Example 74

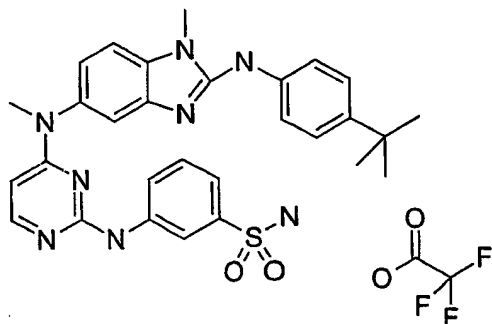
- 5 *[4-(4-{[2-(4-tert-Butyl-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide trifluoroacetic acid*



- The title compound was prepared following the procedure of example 5 using (4-tert-Butyl-phenyl)-{5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester (104 mg, 0.20 mmol) and (4-amino-phenyl)-methanesulfonamide (37 mg, 0.20 mmol) to give the desired product as a white solid.  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO +  $\text{NaHCO}_3$ )  $\delta$  9.42 (s, 1H), 9.04 (s, 1H), 7.80 (d,  $J$  = 6.0 Hz, 1H), 7.71-7.75 (m, 4H), 7.33-7.41 (m, 3H), 7.29 (s, 1H), 7.22 (d,  $J$  = 8.4 Hz, 2H), 7.00 (d,  $J$  = 7.8 Hz, 1H), 6.77 \*s, 2H), 5.70 (d,  $J$  = 6.0 Hz, 1H), 4.17 (s, 2H), 3.74 (s, 3H), 3.48 (s, 3H), 1.28 (m, 9H). MS (ESI)  $m/z$  = 571  $[M+H]^+$ .

### Example 75

*3-(4-{[2-(4-tert-Butyl-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide trifluoroacetic acid*



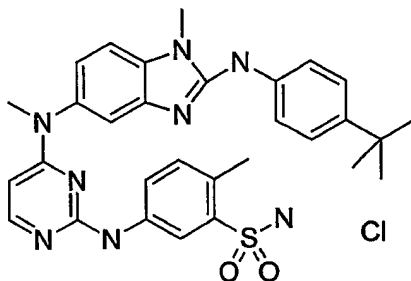
20

The title compound was prepared following the procedure of example 5 using (4-tert-Butyl-phenyl)-{5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester (104 mg, 0.20 mmol) and 3-

amino-benzenesulfonamide (34 mg, 0.20 mmol) to give the desired product as a white solid (85 mg, 63%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.57 (s, 1H), 9.01 (s, 1H), 8.60 (s, 1H), 7.72–7.82 (m, 4H), 7.33–7.42 (m, 5H), 7.26–7.29 (M, 3H), 6.98 (dd, J = 8.4 and 1.5 Hz, 1H), 5.68 (d, J = 6.0 Hz, 1H), 3.73 (s, 3H), 3.49 (s, 3H), 1.28 (s, 9H). MS (ESI) m/z = 557 [M+H]<sup>+</sup>.

### Example 76

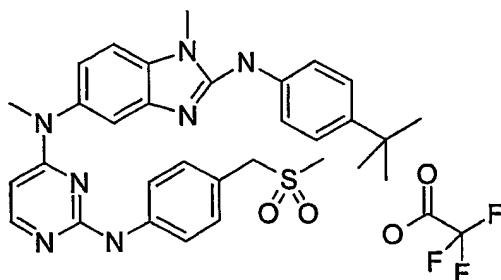
*5-(4-{[2-(4-tert-Butyl-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide hydrochloric acid*



The title compound was prepared following the procedure of example 5 using (4-tert-Butyl-phenyl)-{5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester (104 mg, 0.20 mmol) and 5-amino-2-methyl-benzenesulfonamide (37 mg, 0.20 mmol) to give the desired product as a white solid (66 mg, 48%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.35 (s, 1H), 8.96 (s, 1H), 8.62 (s, 1H), 7.71–7.78 (m, 4H), 7.32–7.38 (M, 3H), 7.27 (s, 1H), 7.17–7.23 (M, 3H), 6.96 (d, J = 8.4 Hz, 1H), 5.63 (d, J = 6.0 Hz, 1H), 3.74 (s, 3H), 3.48 (s, 3H), 2.50 (s, 3H), 1.28 (s, 9H). MS (ESI) m/z = 571 [M+H]<sup>+</sup>.

### Example 77

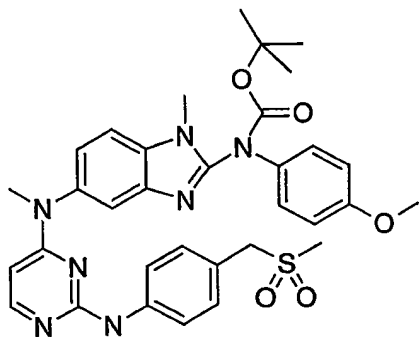
*N<sup>2</sup>-(4-tert-Butyl-phenyl)-N<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine trifluoroacetic acid*



The title compound was prepared following the procedure of example 5 using (4-tert-Butyl-phenyl)-{5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester (104 mg, 0.20 mmol) and 4-[(methylsulfonyl)methyl]aniline (37 mg, 0.20 mmol) to give the desired product as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.51 (s, 1H), 9.07 (s, 1H), 7.81 (d, J = 6.3 Hz, 1H), 7.71-7.77 (m, 4H), 7.24-7.41 (m, 6H), 7.00 (dd, J = 8.4 and 1.5 Hz, 1H), 5.72 (d, J = 6.0 Hz, 1H), 4.36 (s, 2H), 3.74 (s, 3H), 3.48 (s, 3H), 2.85 (s, 3H), 1.28 (s, 9H). MS (ESI) m/z = 570 [M+H]<sup>+</sup>.

### Example 78

*(5-{[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester*

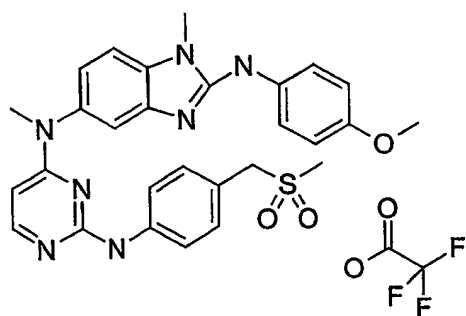


To a solution of {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-(4-methoxy-phenyl)-carbamic acid tert-butyl ester (100 mg, 0.20 mmol) and 4-[(methylsulfonyl)methyl]aniline (37 mg, 0.20 mmol) was added cat HCl and the reaction was heated to 70 C overnight. The reaction was neutralized with solid NaHCO<sub>3</sub>, filtered and concentrated. The crude material as purified through silica gel to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.24 (s, 1H), 7.82 (d, J = 6.0 Hz, 1H), 7.65-7.74 (m, 3H), 7.54 (d, J = 1.5 Hz, 1H), 7.35 (d, J = 8.7 Hz, 2H), 7.24 (dd, J = 8.7 and 1.5 Hz, 1H), 7.18 (d, J = 8.4 Hz, 2H), 6.94 (d, J = 9.0 Hz, 2H), 5.72 (d, J = 5.7 Hz, 1H), 4.32 (s, 2H), 3.78 (s, 3H), 3.74 (s, 3H), 3.46 (s, 3H), 2.84 (s, 3H), 1.41 (s, 9H). MS (ESI) m/z = 644 [M+H]<sup>+</sup>.

### Example 79

*N<sup>5</sup>-[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-N<sup>2</sup>-(4-methoxy-phenyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine*

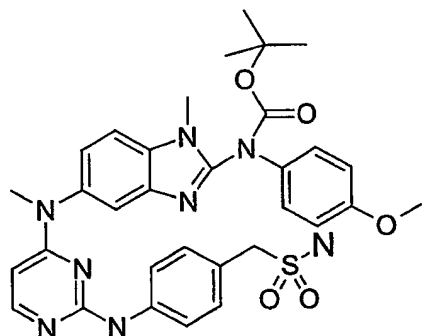




(5-{[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester was deprotected according to the procedure of example 61 to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.48 (s, 1H), 9.12 (s, 1H), 7.81 (d, J = 6.0 Hz, 1H), 7.69-7.76 (m, 4H), 7.41 (d, J = 8.1 Hz, 1H), 7.24-7.27 (m, 3H), 7.02 (d, J = 8.1 Hz, 1H), 6.95 (d, J = 9.0 Hz, 2H), 5.73 (d, J = 6.0 Hz, 1H), 4.36 (s, 2H), 3.74 (s, 3H), 3.73 (s, 3H), 3.47 (s, 3H), 2.86 (s, 3H). MS (ESI) m/z = 544 [M+H]<sup>+</sup>.

#### Example 80

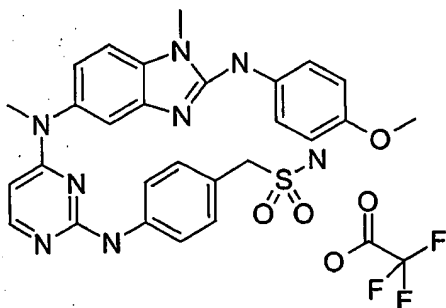
*(4-Methoxy-phenyl)-(1-methyl-5-{methyl-[2-(4-sulfamoylmethyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-carbamic acid tert-butyl ester*



The title compound was prepared following the procedure of example 78 using {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-(4-methoxy-phenyl)-carbamic acid tert-butyl ester (100 mg, 0.20 mmol) and (4-amino-phenyl)-methanesulfonamide (37 mg, 0.20 mmol) to give the desired product as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.20 (s, 1H), 7.81 (d, J = 6.0 Hz, 1H), 7.65-7.73 (m, 3H), 7.54 (d, J = 1.8 Hz, 1H), 7.34 (d, J = 8.7 Hz, 2H), 7.24 (dd, J = 8.4 and 1.8 Hz, 1H), 7.16 (d, J = 8.4 Hz, 2H), 6.97 (d, J = 9.0 Hz, 2H), 6.75 (s, 2H), 5.69 (d, J = 6.0 Hz, 1H), 4.14 (s, 2H), 3.78 (s, 3H), 3.74 (s, 3H), 3.46 (s, 3H), 1.41 (s, 9H). MS (ESI) m/z = 645 [M+H]<sup>+</sup>.

## Example 81

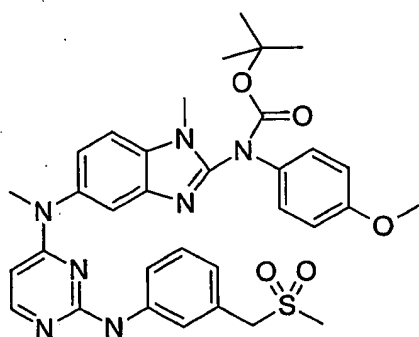
*[4-(4-{[2-(4-Methoxy-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide trifluoroacetic acid*



(4-Methoxy-phenyl)-(1-methyl-5-{methyl-[2-(4-sulfamoylmethyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-carbamic acid tert-butyl ester was deprotected according to the procedure of example 78 to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.70 (s, 1H), 9.22 (s, 1H), 7.82 (d, J = 6.3 Hz, 1H), 7.68-7.71 (m, 4H), 7.43 (d, J = 8.1 Hz, 1H), 7.22-7.33 (m, 3H), 7.04 (d, J = 8.1 Hz, 1H), 6.95 (d, J = 8.7 Hz, 2H), 6.79 (s, 2H), 5.74 (d, J = 5.4 Hz, 1H), 4.18 (s, 2H), 3.74 (s, 6H), 3.48 (s, 3H). MS (ESI) m/z = 545 [M+H]<sup>+</sup>.

## Example 82

*(5-{[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester*

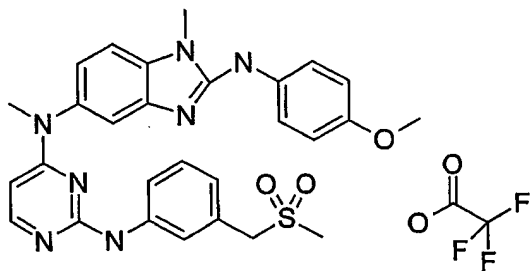


The title compound was prepared following the procedure of example 78 using {5-[[2-(4-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl]}-(4-methoxy-phenyl)-carbamic acid tert-butyl ester (100 mg, 0.20 mmol) and 3-methanesulfonylmethyl-phenylamine (37 mg, 0.20 mmol) to give the desired product as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.44 (s, 1H), 7.80-7.82 (m, 2H), 7.63-7.70 (m, 2H), 7.56 (d, J = 1.5 Hz, 1H), 7.34 (d, J = 8.7 Hz, 2H), 7.25 (dd, J = 8.6 and 1.2

Hz, 1H), 7.18 (t,  $J = 7.5$  Hz, 1H), 6.94 (d,  $J = 9.0$  Hz, 2H), 5.75 (d,  $J = 6.0$  Hz, 1H), 4.34 (s, 2H), 3.79 (s, 3H), 3.74 (s, 3H), 3.47 (s, 3H), 2.89 (s, 3H), 1.41 (s, 9H). MS (ESI)  $m/z = 644$   $[M+H]^+$ .

### 5 Example 83

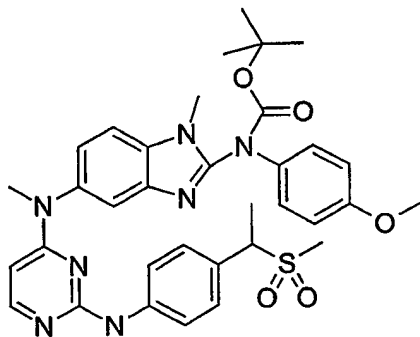
*N<sup>5</sup>-[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-N<sup>2</sup>-(4-methoxy-phenyl)-1,N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine trifluoroacetic acid*



(5-{[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester was deprotected according to the procedure of example 61 to give the title compound as a white solid. <sup>1</sup>H NMR (300 MHz,  $d_6$ -DMSO + NaHCO<sub>3</sub>)  $\delta$  9.36 (s, 1H), 8.94 (s, 1H), 7.87 (s, 1H), 7.80 (d,  $J = 6.0$  Hz, 1H), 7.67-7.75 (m, 3H), 7.21-7.26 (m, 2H), 7.37 (d,  $J = 8.4$  Hz, 1H), 6.91-6.99 (m, 4H), 5.70 (d,  $J = 6.0$  Hz, 1H), 4.34 (s, 2H), 3.73 (s, 3H), 3.72 (s, 3H), 3.46 (s, 3H), 2.89 (s, 3H). MS (ESI)  $m/z = 544$   $[M+H]^+$ .

### Example 84

*[5-({2-[4-(1-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-methyl-amino)-1-methyl-1H-benzoimidazol-2-yl]-(4-methoxy-phenyl)-carbamic acid tert-butyl ester*



20

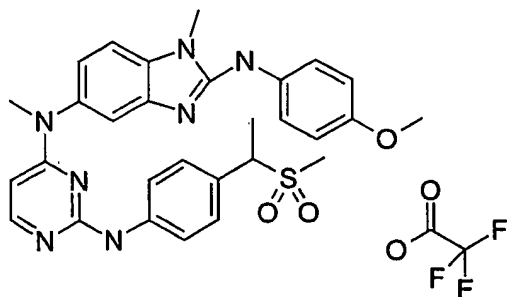
The title compound was prepared following the procedure of example 78 using {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzoimidazol-2-yl}-(4-methoxy-phenyl)-carbamic acid tert-butyl ester (100 mg, 0.20 mmol) 4-(1-methanesulfonyl-ethyl)-phenylamine (40 mg, 0.20 mmol) to give the desired product

as a white solid.  $^1\text{H}$  NMR (300 MHz,  $\text{d}_6$ -DMSO)  $\delta$  9.25 (s, 1H), 7.82 (d,  $J$  = 6.0 Hz, 1H), 7.65-7.74 (m, 3H), 7.54 (s, 1H), 7.35 (d,  $J$  = 8.7 Hz, 2H), 7.21-7.25 (m, 3H), 6.94 (d,  $J$  = 9.0 Hz, 2H), 5.72 (d,  $J$  = 6.0 Hz, 1H), 4.37 (m, 1H), 3.78 (s, 3H), 3.74 (s, 3H), 3.46 (s, 3H), 2.75 (s, 3H), 1.58 (d,  $J$  = 7.2 Hz, 3H), 1.41 (s, 9H). MS (ESI)  $m/z$  = 658  $[\text{M}+\text{H}]^+$ .

5

### Example 85

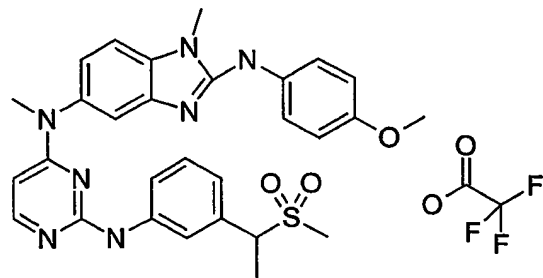
$N^5$ -{2-[4-(1-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxy-phenyl)-1, $N^5$ -dimethyl-1H-benzimidazole-2,5-diamine trifluoroacetic acid



- 10 [5-({2-[4-(1-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-methyl-amino)-1-methyl-1H-benzimidazol-2-yl]-(4-methoxy-phenyl)-carbamic acid tert-butyl ester was deprotected according to the procedure of example 61 to give the title compound as a white solid.  $^1\text{H}$  NMR (300 MHz,  $\text{d}_6$ -DMSO +  $\text{NaHCO}_3$ )  $\delta$  9.38 (s, 1H), 9.00 (s, 1H), 7.81 (d,  $J$  = 6.0 Hz, 1H), 7.72-7.74 (m, 4H), 7.38 (d,  $J$  = 8.4 Hz, 1H), 7.26-7.28 (m, 3H), 6.92-7.00 (m, 3H), 5.72 (d,  $J$  = 5.7 Hz, 1H), 4.40 (m, 1H), 3.73 (s, 6H), 3.47 (s, 3H), 2.76 (s, 3H), 1.59 (d,  $J$  = 7.2 Hz, 3H). MS (ESI)  $m/z$  = 558  $[\text{M}+\text{H}]^+$ .
- 15

### Example 86

- 20  $N^5$ -{2-[3-(1-Methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxy-phenyl)-1, $N^5$ -dimethyl-1H-benzimidazole-2,5-diamine trifluoroacetic acid

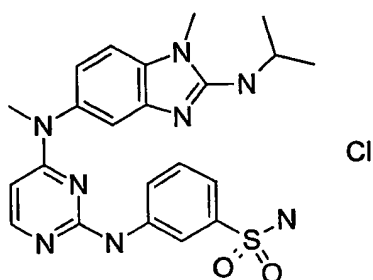


The title compound was prepared following the procedure of example 5 using {5-[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1H-benzimidazol-2-yl}-(4-methoxy-phenyl)-carbamic acid tert-butyl ester (100 mg, 0.20 mmol) and 3-(1-

Methanesulfonyl-ethyl)-phenylamine hydrochloride (47 mg, 0.20 mmol) to give the desired product as a white solid. <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.23 (s, 1H), 8.86 (s, 1H), 7.96 (s, 1H), 7.80 (d, J = 6.0 Hz, 1H), 7.75 (d, J = 8.7 Hz, 2H), 7.64 (d, J = 8.1 Hz, 1H), 7.36 (d, J = 8.4 Hz, 1H), 7.19-7.26 (M, 2H), 6.90-6.98 (m, 4H), 5.69 (d, J = 5.7 Hz, 1H), 4.28 (m, 1H), 3.73 (s, 3H), 3.72 (s, 3H), 3.47 (s, 3H), 2.77 (s, 3H), 1.59 (d, J = 7.2 Hz, 3H). MS (ESI) m/z = 558 [M+H]<sup>+</sup>.

### Example 87

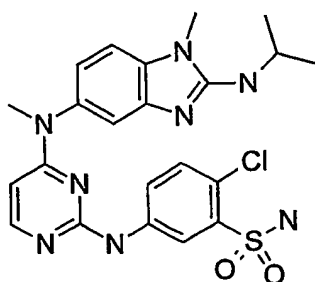
3-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide hydrochloride



The title compound was prepared following the procedure of example 1 with N<sup>6</sup>-(2-chloropyrimidin-4-yl)-N<sup>2</sup>-isopropyl-N<sup>6</sup>,1-dimethyl-1H-benzimidazole-2,5-diamine (83 mg, 0.25 mmol) and 3-amino-benzenesulfonamide (43 mg, 0.25 mmol) as a white solid (59 mg, 47%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 11.03 (s, 1H), 8.94 (d, J = 8.1 Hz, 1H), 8.35 (s, 1H), 7.97 (d, J = 7.2 Hz, 1H), 7.71 (d, J = 7.2 Hz, 1H), 7.66 (d, J = 8.4 Hz, 1H), 7.48-7.57 (m, 3H), 7.40 (s, 1H), 7.33 (dd, J = 8.4 and 1.5 Hz, 1H), 5.90 (s, 1H), 4.12 (m, 1H), 3.70 (s, 3H), 3.54 (s, 3H), 1.33 (d, J = 6.3 Hz, 6H) ppm. MS (ESI) m/z = 467 [M+H]<sup>+</sup>.

### Example 88

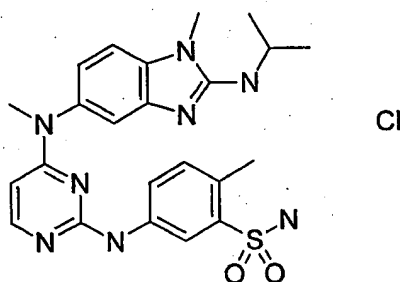
2-Chloro-5-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide



The title compound was prepared following the procedure of example 1 with *N*<sup>6</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>2</sup>-isopropyl-*N*<sup>5</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine (83 mg, 0.25 mmol) and 5-amino-2-chloro-benzenesulfonamide (52 mg, 0.25 mmol) as a white solid (74 mg, 59%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.58 (s, 1H), 8.78 (s, 1H), 7.83 (dd, *J* = 8.7 and 2.1 Hz, 1H), 7.78 (d, *J* = 5.7 Hz, 1H), 7.55 (br s, 1H), 7.40 (d, *J* = 8.7 Hz, 1H), 7.19 (d, *J* = 8.4 Hz, 1H), 7.08 (s, 12H), 6.80 (d, *J* = 8.1 Hz, 1H), 6.61 (d, *J* = 7.5 Hz, 1H), 5.64 (d, *J* = 6.0 Hz, 1H), 4.04 (m, 1H), 3.52 (s, 3H), 3.45 (s, 3H), 1.23 (d, *J* = 6.3 Hz, 6H) ppm. MS (ESI) *m/z* = 501 [M+H]<sup>+</sup>.

#### 10 Example 89

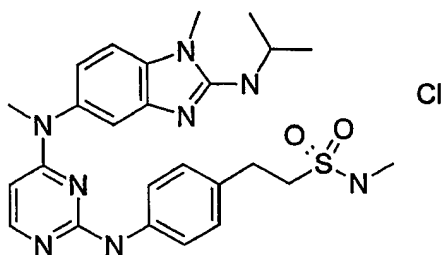
*5*-{4-[(2-Isopropylamino-1-methyl-1*H*-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-2-methyl-benzenesulfonamide hydrochloride



The title compound was prepared following the procedure of example 1 with *N*<sup>6</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>2</sup>-isopropyl-*N*<sup>5</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine (60 mg, 0.18 mmol) and 5-amino-2-methyl-benzenesulfonamide (34 mg, 0.18 mmol) as a white solid (42 mg, 45%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.85 (s, 1H), 8.67 (s, 1H), 8.51 (s, 1H), 7.87 (d, *J* = 6.3 Hz, 1H), 7.67 (d, *J* = 8.1 Hz, 1H), 7.57 (d, *J* = 8.4 Hz, 1H), 7.37 (s, 1H), 7.18-7.27 (m, 3H), 5.73 (d, *J* = 6.0 Hz, 1H), 4.11 (m, 1H), 3.68 (s, 3H), 3.48 (s, 3H), 1.32 (d, *J* = 6.3 Hz 6H) ppm. MS (ESI) *m/z* = 481 [M+H]<sup>+</sup>.

#### Example 90

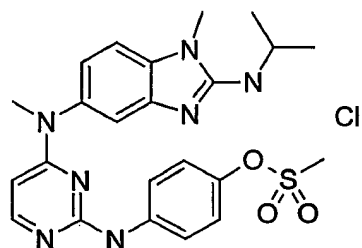
*2*-(4-{4-[(2-Isopropylamino-1-methyl-1*H*-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide hydrochloride



The title compound was prepared following the procedure of example 1 with *N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>2</sup>-isopropyl-*N*<sup>5</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine (83 mg, 0.25 mmol) and 2-(4-amino-phenyl)-ethanesulfonic acid methylamide (54 mg, 0.25 mmol) as a white solid (71 mg, 52%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.05 (s, 1H), 7.68-7.76 (M, 3H), 7.19 (d, *J* = 8.4 Hz, 1H), 7.08-7.13 (M, 3H), 6.96 (q, *J* = 5.1 Hz, 1h), 6.81 (dd, *J* = 8.1 and 1.8 Hz, 1H), 6.53 (d, *J* = 6.9 Hz, 1H), 5.60 (d, *J* = 5.7 Hz, 1H), 4.04 (m, 1H), 3.51 (s, 3H), 3.42 (s, 3H), 3.21-3.30 (m, 2H), 2.83-2.88 (m, 2H), 2.59 (d, *J* = 5.1 Hz, 3H), 1.23 (d, *J* = 6.6 Hz, 6H) ppm. MS (ESI) *m/z* = 509 [M+H]<sup>+</sup>.

### Example 91

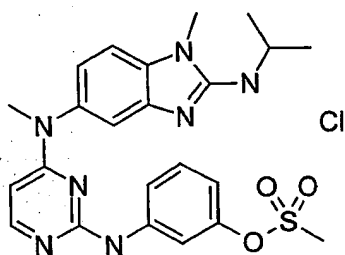
*Methanesulfonic acid 4-{4-[(2-isopropylamino-1-methyl-1*H*-benzimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl ester hydrochloride*



The title compound was prepared following the procedure of example 1 with *N*<sup>5</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>2</sup>-isopropyl-*N*<sup>5</sup>,1-dimethyl-1*H*-benzimidazole-2,5-diamine (83 mg, 0.25 mmol) and methanesulfonic acid 4-amino-phenyl ester (47 mg, 0.25 mmol) as a white solid (45 mg, 35%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.30 (s, 1H), 7.78-7.86 (m, 3H), 7.17-7.21 (m, 3H), 7.09 (d, *J* = 1.5 Hz, 1H), 6.82 (dd, *J* = 8.1 and 1.8 Hz, 1H), 6.51 (d, *J* = 7.5 Hz, 1H), 5.67 (d, *J* = 6.0 Hz, 1H), 4.05 (m, 1H), 3.52 (s, 3H), 3.43 (s, 3H), 3.31 (s, 3H), 1.24 (d, *J* = 6.6 Hz, 6H) ppm. MS (ESI) *m/z* = 482 [M+H]<sup>+</sup>.

## Example 92

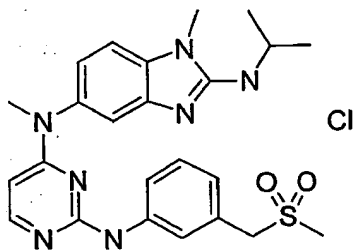
*Methanesulfonic acid 3-{4-[(2-isopropylamino-1-methyl-1H-benzimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl ester hydrochloride*



- 5 The title compound was prepared following the procedure of example 1 with  $N^6$ -(2-chloropyrimidin-4-yl)- $N^2$ -isopropyl- $N^5$ ,1-dimethyl-1H-benzimidazole-2,5-diamine (83 mg, 0.25 mmol) and methanesulfonic acid 3-amino-phenyl ester hydrochloride (56 mg, 0.25 mmol) as a white solid (55 mg, 43%).  $^1\text{H}$  NMR (300 MHz,  $\text{d}_6$ -DMSO)  $\delta$  9.41 (s, 1H), 8.02 (s, 1H), 7.79 (d,  $J$  = 6.0 Hz, 1H), 7.65 (d,  $J$  = 8.4 Hz, 1H), 7.30 (t,  $J$  = 8.2 Hz, 1H), 7.20 (d,  $J$  = 8.1 Hz, 1H), 7.10 (s, 1H), 6.81-6.86 (m, 2H), 6.55 (d,  $J$  = 7.8 Hz, 1H), 5.46 (d,  $J$  = 5.7 Hz, 1H), 4.05 (m, 1H), 3.52 (s, 3H), 3.44 (s, 3H), 3.34 (s under  $\text{H}_2\text{O}$ , 3H) ppm. MS (ESI)  $m/z$  = 482  $[\text{M}+\text{H}]^+$ .
- 10

## Example 93

- 15  $N^2$ -Isopropyl- $N^5$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, $N^5$ -dimethyl-1H-benzimidazole-2,5-diamine hydrochloride



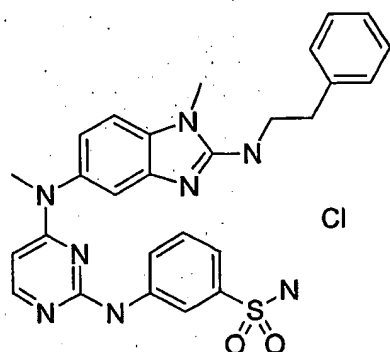
- The title compound was prepared following the procedure of example 1 with  $N^6$ -(2-chloropyrimidin-4-yl)- $N^2$ -isopropyl- $N^5$ ,1-dimethyl-1H-benzimidazole-2,5-diamine (83 mg, 0.25 mmol) and 3-Methanesulfonylmethyl-phenylamine (46 mg, 0.25 mmol) as a white solid (69 mg, 53%).  $^1\text{H}$  NMR (300 MHz,  $\text{d}_6$ -DMSO)  $\delta$  9.20 (s, 1H), 7.90 (s, 1H), 7.77 (d,  $J$  = 6.0 Hz, 1H), 7.69 (d,  $J$  = 8.1 Hz, 1H), 7.18-7.25 (m, 2H), 7.09 (d,  $J$  = 1.8 Hz, 1H), 6.91 (d,  $J$  = 7.5 Hz, 1H), 6.82 (dd,  $J$  = 8.1 and 1.8 Hz, 1H), 6.49 (d,  $J$  = 7.5
- 20



Hz, 1H), 5.64 (d,  $J = 6.0$  Hz, 1H), 4.34 (s, 2H), 4.03 (m, 1h), 3.51 (s, 3H), 3.43 (s, 3H), 2.89 (s, 3H), 1.24 (d,  $J = 6.6$  Hz, 6H) ppm. MS (ESI)  $m/z = 480$   $[M+H]^+$ .

#### Example 94

##### 5 3-[4-(1-Methyl-2-phenethylamino-1H-benzoimidazol-5-ylamino)-pyrimidin-2-ylamino]-benzenesulfonamide hydrochloride

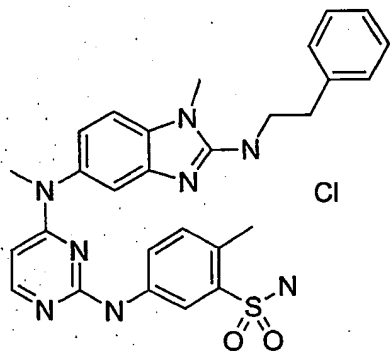


The title compound was prepared following the procedure of example 1 with  $N^6$ -(2-Chloro-pyrimidin-4-yl)-1, $N^6$ -dimethyl- $N^2$ -phenethyl-1H-benzoimidazole-2,5-diamine (98 mg, 0.25 mmol) and 3-amino-benzenesulfonamide (43 mg, 0.25 mmol) as a white solid (95 mg, 67%).  $^1\text{H}$  NMR (400 MHz,  $d_6$ -DMSO)  $\delta$  9.83 (br s, 1H), 9.04 (br s, 1H), 8.49 (s, 1H), 7.87 (d,  $J = 6.0$  Hz, 1H), 7.72-7.74 (m, 1H), 7.56 (d,  $J = 8.4$  Hz, 1H), 7.18-7.40 (m, 11H), 5.72 (d,  $J = 5.6$  Hz, 1H), 3.65-3.71 (m, 2H), 3.64 (s, 3H), 3.46 (s, 3H), 2.96 (m, 2H) ppm. MS (ESI)  $m/z = 529$   $[M+H]^+$ .

15

#### Example 95

##### 2-Methyl-5-{4-[methyl-(1-methyl-2-phenethylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide hydrochloride

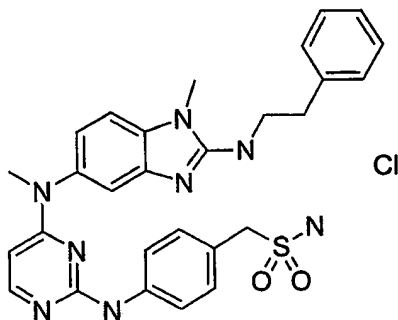


20

The title compound was prepared following the procedure of example 1 with *N*<sup>6</sup>-(2-Chloro-pyrimidin-4-yl)-1, *N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-phenethyl-1H-benzoimidazole-2,5-diamine (98 mg, 0.25 mmol) and 5-amino-2-methyl-benzenesulfonamide (46 mg, 0.25 mmol) as a white solid (88 mg, 61%). <sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 10.25 (br s, 1H), 9.22 (br s, 1H), 8.44 (s, 1H), 7.87 (d, J = 6.8 Hz, 1H), 7.58-7.64 (m, 2H), 7.18-7.41 (m, 10H), 5.75 (d, J = 5.6 Hz, 1H), 3.68-3.73 (m, 2H), 3.66 (s, 3H), 3.48 (s, 3H), 2.97 (m, 2H), 2.50 (s, 3H) ppm. MS (ESI) m/z = 543 [M+H]<sup>+</sup>.

### Example 96

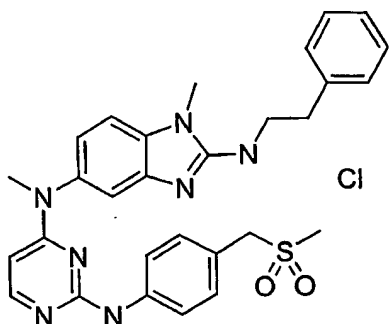
(4-{4-[Methyl-(1-methyl-2-phenethylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide hydrochloride



The title compound was prepared following the procedure of example 1 with *N*<sup>6</sup>-(2-Chloro-pyrimidin-4-yl)-1, *N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-phenethyl-1H-benzoimidazole-2,5-diamine (98 mg, 0.25 mmol) and (4-amino-phenyl)-methanesulfonamide (46 mg, 0.25 mmol) as a white solid (37 mg, 26%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.17 (s, 1H), 7.76-7.78 (m, 3H), 7.21-7.34 (m, 8H), 7.19 (s, 1H), 7.13 (d, J = 1.8 Hz, 1H), 7.00 (br s, 1H), 6.84 (dd, J = 8.1 and 1.5 Hz, 1H), 6.77 (s, 2H), 5.63 (d, J = 6.0 Hz, 1H), 4.16 (s, 2H), 3.54-3.61 (m, 2H), 3.52 (s, 3H), 3.45 (s, 3H), 2.92-2.97 (m, 2H) ppm. MS (ESI) m/z = 543 [M+H]<sup>+</sup>.

### Example 97

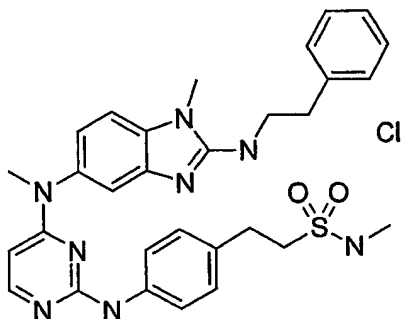
*N*<sup>5</sup>-[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-phenethyl-1H-benzoimidazole-2,5-diamine



The title compound was prepared following the procedure of example 1 with *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1, *N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-phenethyl-1H-benzimidazole-2,5-diamine (98 mg, 0.25 mmol) and 4-[(methylsulfonyl)methyl]aniline (46 mg, 0.25 mmol) as a white solid (120 mg, 83%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.21 (s, 1H), 7.77-7.81 (m, 3H), 7.18-7.33 (m, 8H), 7.12 (d, J = 1.5 Hz, 1H), 7.00 (t, J = 5.7 Hz, 1H), 6.83 (dd, J = 8.1 and 1.5 Hz, 1H), 5.65 (d, J = 6.0 Hz, 1H), 4.35 (s, 2H), 3.54-3.61 (M, 2H), 3.52 (s, 3H), 3.44 (s, 3H), 2.92-2.97 (m, 2H), 2.86 (s, 3H) ppm. MS (ESI) m/z = 542 [M+H]<sup>+</sup>.

#### 10 Example 98

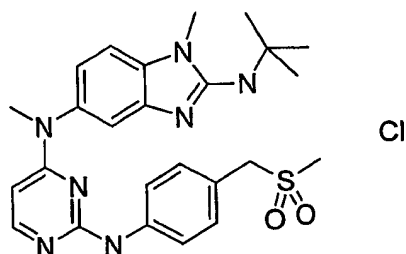
*2-(4-{4-[Methyl-(1-methyl-2-phenethylamino-1H-benzimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide hydrochloride*



The title compound was prepared following the procedure of example 1 with *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-1, *N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-phenethyl-1H-benzimidazole-2,5-diamine (98 mg, 0.25 mmol) and 2-(4-amino-phenyl)-ethanesulfonic acid methylamide (54 mg, 0.25 mmol) as a white solid (100 mg, 66%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 9.30 (s, 1H), 7.82 (d, J = 6.0 Hz, 1H), 7.65 (d, J = 8.4 Hz, 2H), 7.43 (d, J = 8.4 Hz, 1H), 7.20-7.33 (m, 5H), 7.06-7.14 (m, 3H), 6.98 (q, J = 6.2 Hz, 1H), 5.70 (d, J = 6.0 Hz, 1H), 3.65 (m, 2H), 3.60 (s, 3H), 3.45 (s, 3H), 3.21-3.26 (m, 2H), 2.95-3.00 (M, 2H), 2.84-2.90 (m, 2H), 2.59 (d, J = 5.1 Hz, 3H) ppm. MS (ESI) m/z = 571 [M+H]<sup>+</sup>.

#### Example 99

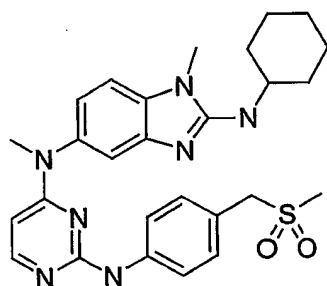
*N*<sup>2</sup>-*tert*-Butyl-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine hydrochloride



The title compound was prepared following the procedure of example 1 with  
 5 *N*<sup>2</sup>-*tert*-butyl-*N*<sup>5</sup>-(2-chloro-pyrimidin-4-yl)-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine (69 mg, 0.20 mmol) and 4-[(methanesulfonyl)methyl]aniline (37 mg, 0.20 mmol) as a white solid (111 mg, 95%). <sup>1</sup>H NMR (300 MHz, *d*<sub>6</sub>-DMSO) δ 9.28 (s, 1H), 7.77-7.79 (m, 3H), 7.24 (d, *J* = 8.4 Hz, 3H), 7.16 (d, *J* = 1.5 Hz, 1H), 6.88 (d, *J* = 7.8 Hz, 1H), 6.21 (br s, 1H), 5.67 (d, *J* = 6.0 Hz, 1H), 4.35 (s, 2H), 3.54 (s, 3H), 3.45 (s, 3H), 2.86 (s, 3H),  
 10 1.47 (s, 9H) ppm. MS (ESI) *m/z* = 494 [M+H]<sup>+</sup>.

#### Example 100

15 *N*<sup>2</sup>-Cyclohexyl-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine

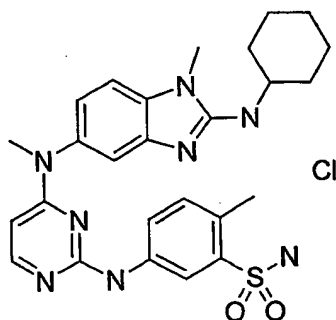


The title compound was prepared following the procedure of example 1 with  
 20 *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-cyclohexyl-1,*N*<sup>5</sup>-dimethyl-1*H*-benzimidazole-2,5-diamine (92 mg, 0.25 mmol) and 4-[(methanesulfonyl)methyl]aniline (46 mg, 0.25 mmol) as a white solid (31 mg, 24%). <sup>1</sup>H NMR (300 MHz, *D*<sub>6</sub>-DMSO) δ 9.20 (s, 1H), 7.77-7.80 (M, 3 H), 7.10 (s, 1H), 6.82 (d, *J* = 7.8 Hz, 1H), 6.50 (d, *J* = 7.5 Hz, 1H), 5.64 (d, *J* = 6.0 Hz, 1H), 4.34 (s, 2H), 3.70 (br s, 1H), 3.51 (s, 3H), 3.44 (s, 3H), 2.85 (s, 3H), 2.01 (br s, 2H), 1.74 (br s, 2H), 1.62 (d, *J* = 11.1 Hz, 1H), 1.16-1.32 (m, 5H) ppm. MS (ESI) *m/z* = 520 [M+H]<sup>+</sup>.

25

#### Example 101

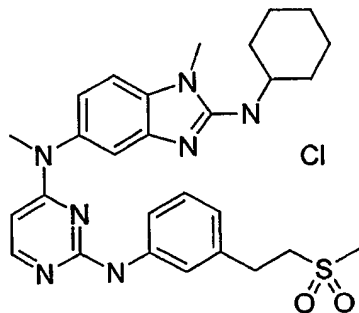
*5*-{4-[(2-Cyclohexylamino-1-methyl-1*H*-benzimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-2-methyl-benzenesulfonamide hydrochloride



The title compound was prepared following the procedure of example 1 with  $N^5$ -(2-Chloro-pyrimidin-4-yl)- $N^2$ -cyclohexyl-1, $N^5$ -dimethyl-1H-benzimidazole-2,5-diamine (92 mg, 0.25 mmol) and 5-amino-2-methyl-benzenesulfonamide (46 mg, 0.25 mmol) as a white solid (95 mg, 68%).  $^1\text{H}$  NMR (300 MHz,  $\text{D}_6$ -DMSO)  $\delta$  9.51 (s, 1H), 8.56 (s, 1H), 8.18 (br s, 1H), 7.83 (d,  $J$  = 6.0 Hz, 1H), 7.69 (dd,  $J$  = 8.4 and 2.1 Hz, 1H), 7.48 (d,  $J$  = 8.1 Hz, 1H), 7.30 (s, 1H), 7.24 (s, 2H), 7.13-7.18 (m, 2H), 5.69 (d,  $J$  = 6.0 Hz, 1H), 3.70 (m, 1H), 3.64 (s, 3H), 3.47 (s, 3H), 2.50 (s, 3H), 1.98-2.01 (m, 2H), 1.76-1.79 (m, 2H), 1.62-1.66 (m, 1H), 1.29-1.48 (m, 4H), 1.14-1.17 (m, 1H) ppm. MS (ESI)  $m/z$  = 521 [M+H] $^+$ .

#### Example 102

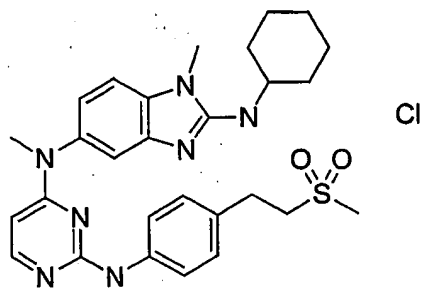
$N^2$ -Cyclohexyl- $N^5$ -{2-[3-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1, $N^5$ -dimethyl-1H-benzimidazole-2,5-diamine hydrochloride



The title compound was prepared following the procedure of example 1 with  $N^5$ -(2-Chloro-pyrimidin-4-yl)- $N^2$ -cyclohexyl-1, $N^5$ -dimethyl-1H-benzimidazole-2,5-diamine (74 mg, 0.20 mmol) and 3-(2-methanesulfonyl-ethyl)-phenylamine (47 mg, 0.20 mmol) as a white solid (59 mg, 52%).  $^1\text{H}$  NMR (300 MHz,  $\text{D}_6$ -DMSO)  $\delta$  9.07 (s, 1H), 7.76-7.78 (m, 2H), 7.60 (d,  $J$  = 8.4 Hz, 1H), 7.13-7.20 (m, 2H), 7.09 (d,  $J$  = 1.8 Hz, 1H), 6.79-6.82 (m, 2H), 6.47 (d,  $J$  = 7.8 Hz, 1H), 5.61 (d,  $J$  = 6.0 Hz, 1H), 3.70 (m, 1H), 3.51 (s, 3H), 3.44 (s, 3H), 3.35-3.40 (m, 2H), 2.97 (s, 3H), 2.91-2.95 (m, 2H), 2.01 (m, 2H), 1.74 (m, 2H), 1.63 (m, 1H), 1.16-1.31 (m, 5H) ppm. MS (ESI)  $m/z$  = 534 [M+H] $^+$ .

**Example 103**

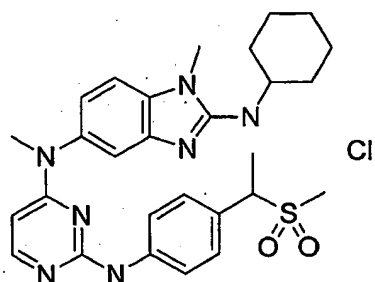
*N*<sup>2</sup>-Cyclohexyl-*N*<sup>5</sup>-{2-[4-(2-methanesulfonyl-ethyl)-phenylamino]-pyridin-4-yl}-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine hydrochloride



5 The title compound was prepared following the procedure of example 1 with *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-cyclohexyl-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine (74 mg, 0.20 mmol) and 4-(2-Methanesulfonyl-ethyl)-phenylamine (40 mg, 0.20 mmol) as a white solid (100 mg, 88%). <sup>1</sup>H NMR (300 MHz, D<sub>6</sub>-DMSO) δ 9.12 (s, 1H), 7.78 (d, *J* = 6.0 Hz, 1H), 7.69 (d, *J* = 8.4 Hz, 2H), 7.27 (d, *J* = 8.4 Hz, 1H), 7.11–7.14 (m, 3H), 6.90 (d, *J* = 8.1 Hz, 1H), 5.64 (d, *J* = 6.0 Hz, 1H), 3.72 (m, 1H), 3.56 (s, 3H), 3.43 (s, 3H), 3.30–3.43 (m, 2H), 2.90–2.95 (m, 5H), 1.98 (m, 2H), 1.76 (m, 2H), 1.62 (m, 1H), 1.36 (m, 4H), 1.10 (m, 1H) ppm. MS (ESI) *m/z* = 534 [*M*+*H*]<sup>+</sup>.

**Example 104**

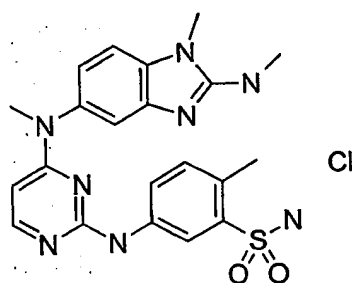
15 *N*<sup>2</sup>-Cyclohexyl-*N*<sup>5</sup>-{2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine hydrochloride



The title compound was prepared following the procedure of example 1 with *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-cyclohexyl-1,*N*<sup>5</sup>-dimethyl-1*H*-benzoimidazole-2,5-diamine (74 mg, 0.20 mmol) and 4-(1-methanesulfonyl-ethyl)-phenylamine (40 mg, 0.20 mmol) as a white solid (104 mg, 91%). <sup>1</sup>H NMR (300 MHz, D<sub>6</sub>-DMSO) δ 9.34 (s, 1H), 7.85 (d, *J* = 6.0 Hz, 1H), 7.71 (d, *J* = 8.4 Hz, 2H), 7.43 (d, *J* = 8.1 Hz, 1H), 7.22–7.26 (m, 3H), 7.08 (d, *J* = 8.1 Hz, 1H), 5.76 (d, *J* = 6.0 Hz, 1H), 4.40 (m, 1H), 3.72 (m, 1H), 3.63 (s, 3H), 3.45 (s, 3H), 2.76 (s, 3H), 1.99 (m, 2H), 1.76 (m, 2H), 1.58–1.65 (m, 4H), 1.33–1.43 (m, 4H), 1.15 (m, 1H) ppm. MS (ESI) *m/z* = 534 [*M*+*H*]<sup>+</sup>.

## Example 105

2-Methyl-5-{4-[methyl-(1-methyl-2-methylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide hydrochloride



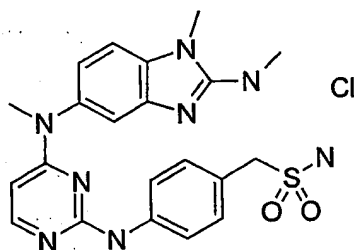
5

The title compound was prepared following the procedure of Example 1 with *N*<sup>6</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>2</sup>,*N*<sup>6</sup>,1-trimethyl-1*H*-benzimidazole-2,5-diamine (58 mg, 0.20 mmol) and 5-amino-2-methyl-benzenesulfonamide (35 mg, 0.20 mmol) as a pink solid (78 mg, 84%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 10.63 (br s, 1H), 9.22 (d, *J* = 4.2 Hz, 1H), 8.40 (br s, 2H), 7.91 (d, *J* = 6.9 Hz, 1H), 7.67 (m, 2H), 7.47 (d, *J* = 1.5 Hz, 1H), 7.28-7.36 (m, 3H), 5.83 (m, 1H), 3.67 (s, 3H), 3.53 (s, 3H), 3.08 (d, *J* = 4.5 Hz, 3H), 2.54 (s, 3H). MS (ESI) *m/z* = 453 [M+H]<sup>+</sup>.

10

## Example 106

15 (4-{4-[Methyl-(1-methyl-2-methylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide hydrochloride

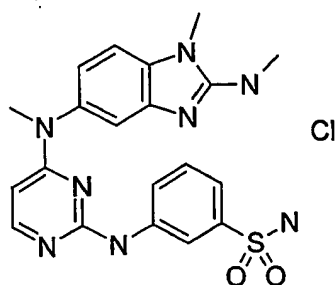


The title compound was prepared following the procedure of Example 1 with *N*<sup>6</sup>-(2-chloropyrimidin-4-yl)-*N*<sup>2</sup>,*N*<sup>6</sup>,1-trimethyl-1*H*-benzimidazole-2,5-diamine (50 mg, 0.17 mmol) and (4-amino-phenyl)-methanesulfonamide (32mg, 0.17 mmol) as a white solid (38 mg, 46%). <sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO + NaHCO<sub>3</sub>) δ 9.71 (br s, 1H), 9.00 (br s, 2H), 7.90 (d, *J* = 6.3 Hz, 1H), 7.61 (m, 3H), 7.39 (s, 1H), 7.26 (d, *J* = 8.4 Hz, 1H), 7.19 (d, *J* = 8.1 Hz, 1H), 6.79 (s, 2H), 5.83 (d, *J* = 5.7 Hz, 1H), 4.17 (s, 2H), 3.66 (s, 3H), 3.48 (s, 3H), 3.06 (d, *J* = 4.5 Hz, 3H). MS (ESI) *m/z* = 453 [M+H]<sup>+</sup>.

25

## Example 107

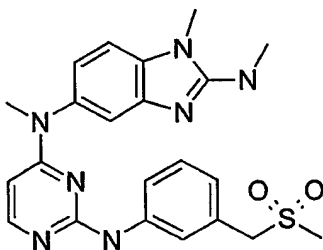
3-{4-[Methyl-(1-methyl-2-methylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide



- 5 The title compound was prepared following the procedure of Example 1 with  $N^5$ -(2-chloropyrimidin-4-yl)- $N^2,N^5$ ,1-trimethyl-1H-benzimidazole-2,5-diamine (60 mg, 0.20 mmol) and 3-amino-benzenesulfonamide (34mg, 0.20 mmol) as a white solid (40 mg, 42%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO +  $\text{NaHCO}_3$ )  $\delta$  9.51 (s, 1H), 8.61 (s, 1H), 7.77-7.82 (M, 2H), 7.26-7.39 (m, 6H), 7.17 (s, 1H), 6.92 (d,  $J$  = 7.8 Hz, 1H), 5.66 (d,  $J$  = 6.0 Hz, 1H), 3.55 (s, 3H), 3.47 (s, 3H), 2.95 (d,  $J$  = 4.2 Hz, 3H). MS (ESI)  $m/z$  = 439  $[\text{M}+\text{H}]^+$ .
- 10

## Example 108

$N^5$ -[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, $N^2,N^5$ -trimethyl-1H-benzoimidazole-2,5-diamine

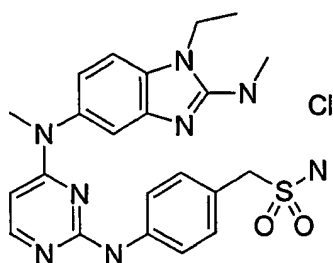


- 15 The title compound was prepared following the procedure of Example 1 with  $N^5$ -(2-chloropyrimidin-4-yl)- $N^2,N^5$ ,1-trimethyl-1H-benzimidazole-2,5-diamine (48 mg, 0.16 mmol) and 3-methanesulfonylmethyl-phenylamine (30mg, 0.16 mmol) as a white solid (75 mg, 83%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  9.23 (s, 1H), 7.89 (s, 1H), 7.79 (d,  $J$  = 6.0 Hz, 1H), 7.68 (d,  $J$  = 8.1 Hz, 1H), 7.19-7.27 (m, 3H), 7.13 (s, 1H), 6.87-6.93 (m, 2H), 5.66 (d,  $J$  = 6.0 Hz, 1H), 4.33 (s, 2H), 3.54 (s, 3H), 3.43 (s, 3H), 2.93 (d,  $J$  = 4.5 Hz, 3H), 2.89 (s, 3H). MS (ESI)  $m/z$  = 452  $[\text{M}+\text{H}]^+$ .
- 20

## 25. Example 109

(4-{4-[(1-Ethyl-2-methylamino-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide hydrochloride

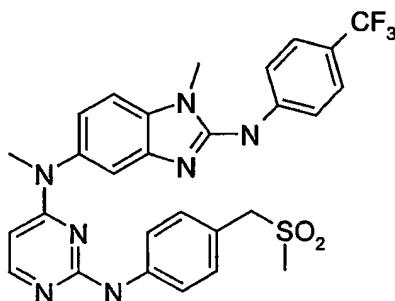




The title compound was prepared following the procedure of Example 1 with  $N^5$ -(2-Chloro-pyrimidin-4-yl)-1-ethyl- $N^2,N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine (79 mg, 0.25 mmol) and (4-amino-phenyl)-methanesulfonamide (46 mg, 0.25 mmol) as a white solid (110 mg, 88%).  $^1\text{H}$  NMR (300 MHz,  $d_6$ -DMSO)  $\delta$  9.24 (s, 1H), 7.81 (d,  $J$  = 6.0 Hz, 1H), 7.74 (m, 3H), 7.36 (d,  $J$  = 8.1 Hz, 1H), 7.17-7.20 (M, 3H), 6.96 (d,  $J$  = 8.4 Hz, 1H), 6.78 (s, 2H), 5.70 (d,  $J$  = 6.0 Hz, 1H), 4.09-4.16 (m, 4H), 3.45 (s, 3H), 2.97 (d,  $J$  = 4.5 Hz, 3H), 1.24 (t,  $J$  = 6.9 Hz, 3H) ppm. MS (ESI)  $m/z$  = 467  $[\text{M}+\text{H}]^+$ .

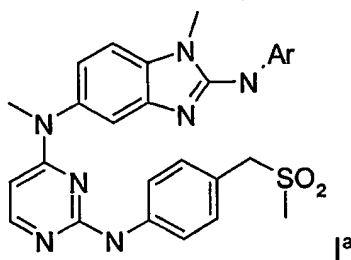
#### Example 110

$N^1$ -Methyl- $N^5$ -[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^5$ -methyl- $N^2$ -(4-trifluoromethyl-phenyl)-1H-benzoimidazole-2,5-diamine



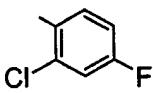
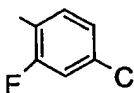
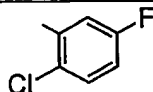
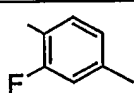
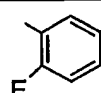
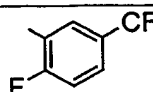
A mixture of  $N^4$ -(2-Methanesulfonyl-1-methyl-1H-benzoimidazol-5-yl)- $N^2$ -(4-methanesulfonylmethyl-phenyl)- $N^4$ -methyl-pyrimidine-2,4-diamine (89 mg, 0.18mmol), 4-(trifluoromethyl)aniline (148mg, 0.9mmol) and a catalytic amount of HCl(1drop, concentrated) in isopropanol was heated in Smith Synthesizer at 150 °C for 10 min.. The reaction mixture was concentrated and purified by prep. HPLC, after concentration the product was treated with HCl(0.1ml,1M in ether) to give the title compound as a pale yellow solid: LC/MS( $m/e$ ) 582.2 $[\text{M}+\text{H}]^+$ ,  $R_t$  at 1.34 min.

The following compounds of Examples 111–125 of Formula I<sup>a</sup> were prepared according to the procedure of Example 110.



5

Example	Ar	LC/MS Rt (min)	LC/MS m/z [M+H] <sup>+</sup>
111		1.52	548.0
112		1.34	548.2
113		1.52	582.2
114		1.6	582.2
115		1.71	616.2
116		1.59	616.2
117		1.54	597.4
118		1.92	532.2
119		1.83	550.0

120		1.77	566.2
121		1.4	566.2
122		1.27	566.2
123		1.26	546.0
124		1.55	532.2
125		1.7	600.0

**Example 126**

- 5 4-{4-[Methyl-(1-methyl-2-methylsulfanyl-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzene sulfonamide

The procedure of Example 5 was utilized, replacing 4-Methanesulfonylmethyl-phenylamine by 4-Amino-benzenesulfonamide, which gave the title compound as a white  
 10 solid: LC/MS(m/e) 456.02[M+H]<sup>+</sup>, Rt at 1.37 min.

**Example 127**

- 15 4-{4-[(2-Methanesulfinyl-1-methyl-1H--benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide

The procedure of Example 6 was utilized, replacing N<sup>2</sup>-(4-Methanesulfonylmethyl-phenyl)-N<sup>4</sup>-methyl-N<sup>4</sup>-(1-methyl-2-methylsulfanyl-1H-benzoimidazol-5-yl)-pyrimidine-2,4-diamine by 4-{4-[Methyl-(1-methyl-2-methylsulfanyl-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzene sulfonamide, which gave the title compound : LC/MS(m/e)  
 20 472.2[M+H]<sup>+</sup>, Rt at 1.24min.

**Example 128**

- 25 4-(4-{Methyl-[1-methyl-2-(4-trifluoromethyl-phenylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide

The procedure of Example 7 was utilized, replacing *N*<sup>4</sup>-(2-Methanesulfonyl-1-methyl-1*H*-benzoimidazol-5-yl)-*N*<sup>2</sup>-(4-methanesulfonylmethyl-phenyl)-*N*<sup>4</sup>-methyl-pyrimidine-2,4-diamine by 4-{4-[(2-Methanesulfonyl-1-methyl-1*H*-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide, which  
 5 gave the title compound as a yellow oil: LC/MS(*m/e*) 569.4[M+H]<sup>+</sup>, *Rt* at 1.41 min.

#### Example 129

*(Methyl-nitro-1H-benzoimidazol-2-yl)-(3-trifluoromethyl-phenyl)-amine*

10 The procedure of Intermediate Example 1B was utilized, replacing isothiocyanate by 3-Trifluoromethyl-phenylamine, which gave the title compound as a dark orange solid: : LC/MS(*m/e*) 337.2[M+H]<sup>+</sup>,

#### Example 130

15 *(Methyl-nitro-1H-benzoimidazol-2-yl)-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester*

(Methyl-nitro-1*H*-benzoimidazol-2-yl)-(3-trifluoromethyl-phenyl)-amine (2.34g) and cesium carbonate (5.61g, 17.2mmol) was stirred in DMF for 15 min., then  
 20 (BOC)<sub>2</sub>O (2.81g, 12.9mmol) was added. The resulting mixture was stirred at room temperature for 4 days, the reaction mixture was then concentrated and the residual was taken into EtOAc and washed by water, then brine, drying and concentration, silica flash, which gave 1.45g of the title compound as a yellow foam: LC/MS(*m/e*) 437[M+H]<sup>+</sup>, *Rt* at 2.34 min.

25

#### Example 131

*(Amino-methyl-1-benzoimidazol-2-yl)-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester*

30 The procedure of Example 3 was utilized, replacing 1-Methyl-2-methylsulfanyl-5-nitro-1*H*-benzoimidazole by (Methyl-nitro-1*H*-benzoimidazol-2-yl)-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester, which gave the title compound as a yellow brownish solid: LC/MS(*m/e*) 407.4[M+H]<sup>+</sup>, *Rt* at 1.62 min.

#### Example 132

35 *[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-1H-benzoimidazol-2-yl)-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester*

The procedure of Intermediate Example 1D was utilized, replacing *N*<sup>2</sup>-isopropyl-1-methyl-1*H*-benzimidazole-2,5-diamine by (Amino-methyl-1-benzimidazol-2-yl)-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester, which gave the title compound as a white solid: LC/MS(*m/e*) 533.2[M+H]<sup>+</sup>, *R*<sub>t</sub> at 2.44 min.

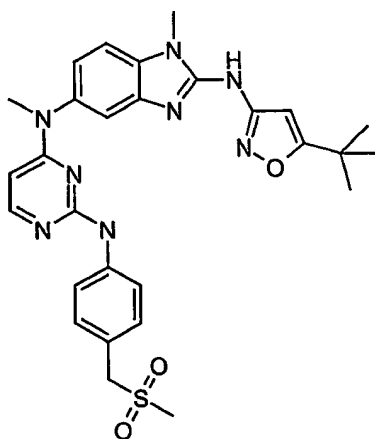
### Example 133

*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>1</sup>,*N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(3-trifluoromethyl-phenyl)-1*H*-benzimidazole-2,5-diamine

The procedure of Example 7 was utilized, replacing *N*<sup>4</sup>-(2-Methanesulfonyl-1-methyl-1*H*-benzimidazol-5-yl)-*N*<sup>2</sup>-(4-methanesulfonylmethyl-phenyl)-*N*<sup>4</sup>-methyl-pyrimidine-2,4-diamine by [(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-1*H*-benzimidazol-2-yl}-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester, which gave the title compound as a yellow solid: LC/MS(*m/e*) 582.0[M+H]<sup>+</sup>, *R*<sub>t</sub> at 1.4 min.

### Example 134

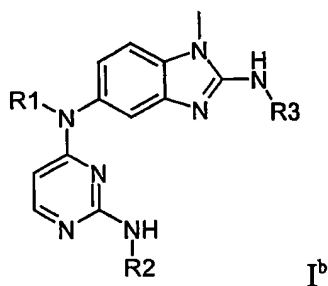
*N*<sup>2</sup>-(5-*tert*-Butyl-isoxazol-3-yl)-*N*<sup>5</sup> [2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*<sup>5</sup>-dimethyl-1*H*-methyl-amino-benzimidazole-2,5-diamine



*N*-(5-*tert*-Butyl-isoxazol-3-yl)-*N*-{5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1*H* benzimidazole-2-yl}-2,2-dimethyl-propionamide (50 mg, 0.10 mmol) and 4-[(methylsulfonyl)methyl]aniline (19mg, 0.10 mmol) were dissolved in isopropanol(2.5 ml). To this solution was added a catalytic amount of HCl and the reaction was heated to 70 °C. for 12 hours. The solvent was removed and the reaction mixture was purified by RPHPLC and by using CH<sub>3</sub>CN : H<sub>2</sub>O: 0.1% TFA solvent as

mobile phase. The solid was dissolved in  $\text{CH}_2\text{Cl}_2$  and neutralized by a 10%  $\text{NaHCO}_3$  solution. The  $\text{CH}_2\text{Cl}_2$  phase was dyied over  $\text{Na}_2\text{SO}_4$  and evaporated to give the title compound  $^1\text{H}$  NMR (400 MHz,  $\text{d}_6$ -DMSO)  $\delta$ 11.3 and 10.6 (s, 1H), 9.6 (d,  $J = 10.9$  Hz, 1H), 7.85 (d, 5.8 Hz, 1H), 7.75 (m, 2H), 7.45 (d,  $J = 5.8$  Hz, 1H), 7.25 –7.45 (m, 2H),  
 5 7.05–7.10 (m, 2H), 5.75(m, 1H), 4.35 (s, 2H), 3.52 (s, 3H), 3.51 (d,  $J = 12$  Hz, 3H), 2.85 (s, 3H), 1.29 (s, 9H) ppm. MS (ESI)  $m/z = 560$   $[\text{M}+\text{H}]^+$ .

The following compounds of Examples 135–141 of Formula I<sup>b</sup> were prepared according to the procedure of Example 134 with the starting materials indicated in  
 10 each Example.



<i>Example #</i>	<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>LC/MS Rt (min)</b>	<b>LC/MS <math>m/z</math> <math>[\text{M}+\text{H}]^+</math></b>
<b>Example 135</b>	H			1.48	547
<b>Example 136</b>	H			1.56	547
<b>Example 137</b>	$\text{CH}_3$			1.72	561
<b>Example 138</b>	H			1.48	548

<b>Example 139</b>	CH <sub>3</sub>			1.57	562
<b>Example 140</b>	H			1.54	604
<b>Example 141</b>	H			2.43	591

**Example 135**

5 *N*<sup>2</sup>-(5-tert-Butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1*H*-benzimidazole-2,5-diamine trifluoroacetate

The title compound was prepared following the procedure of Example 134 with *N*<sup>2</sup>-(5-tert-Butyl-isoxazol-3-yl)-*N*<sup>5</sup> -(2-chloro-pyrimidin-4-yl)-1-methyl-1*H* benzimidazole- 2,5-diamine (50 mg, 0.126mmol) and 4-  
10 [(methylsulfonyl)methyl]aniline (26 mg, 0.139 mmol) to afford a white solid (36 mg, 0.06 mmol). MS (ESI) *m/z* = 547 [M+H]<sup>+</sup>.

**Example 136**

15 *N*<sup>2</sup>-(5-tert-Butyl-isoxazol-3-yl)-*N*<sup>5</sup>--[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1*H*--benzimidazole-2,5-diamine

The title compound was prepared following the procedure of Example 134 with *N*<sup>2</sup>-(5-tert-Butyl-isoxazol-3-yl)-*N*<sup>5</sup> -(2-chloro-pyrimidin-4-yl)-1-methyl-1*H* benzimidazole- 2,5-diamine (50 mg, 0.126mmol) and 4-  
20 [(methylsulfonyl)methyl]aniline (26 mg, 0.139 mmol) to afford a white solid (16mg, 0.03mmol). MS (ESI) *m/z* = 547 [M+H]<sup>+</sup>.

**Example 137**

25 *N*<sup>2</sup>-(5-tert-Butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,*N*5-dimethyl-1-*H*-benzimidazole-2,5-diamine

The title compound was prepared following the procedure of Example 134 with *N*-(5-*tert*-Butyl-isoxazol-3-yl)-*N*-{5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1*H* benzoimidazole-2-yl} -2,2-dimethyl-propionamide (23 mg, 0.045 mmol) and 3-[(methylsulfonyl)methyl]aniline (10 mg, 0.139 mmol) to afford a white solid (5 mg, 0.01mmol). MS (ESI)  $m/z$  = 561 [M+H]<sup>+</sup>.

#### Example 138

10 *N*<sup>2</sup>-(5-*tert*-Butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(3-methanesulfonyl-4-methyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1-*H*-benzoimidazole-2,5-diamine

The title compound was prepared following the procedure of Example 134 with *N*<sup>2</sup>-(5-*tert*-Butyl-isoxazol-3-yl)-*N*<sup>5</sup> -(2-chloro-pyrimidin-4-yl)-1-methyl-1*H* benzoimidazole-2,5-diamine (40 mg, 0.10 mmol) and 5-Amino-2-methyl-benzenesulfonamide (27 mg, 0.11 mmol) to afford an off white solid (26 mg, 0.048mmol). MS (ESI)  $m/z$  = 547 [M+H]<sup>+</sup>.

#### Example 139

20 5-(4-{2-(5-*tert*--Butyl-isoxazol-3-ylamino)-1-methyl-1-*H*-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide

The title compound was prepared following the procedure of Example 134 with *N*-(5-*tert*-Butyl-isoxazol-3-yl)-*N*-{5-[(2-chloro-pyrimidin-4-yl)-methyl-amino]-1-methyl-1*H* benzoimidazole-2-yl} -2,2-dimethyl-propionamide (50 mg, 0.10 mmol) and 3-[(methylsulfonyl)methyl]aniline (23 mg, 0.10 mmol) to afford an off white solid (20 mg, mmol). MS (ESI)  $m/z$  = 562 [M+H]<sup>+</sup>.

#### Example 140

30 *N*<sup>2</sup>-(6-Fluoro-4-*H* benzo[1,3]dioxin-8-ylmethyl)- *N*<sup>5</sup> -[2-(3-methanesulfonyl-4-methyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1*H*-benzoimidazole-2,5-diamine

The title compound was prepared following the procedure of Example 134 with *N*<sup>5</sup>-(2-Chloro-pyrimidin-4-yl)-*N*<sup>2</sup>-(6-Fluoro-4-*H* benzo[1,3]dioxin-8-ylmethyl)-1*H*-benzoimidazole-2,5-diamine (35 mg, 0.08 mmol) and 3-



[(methylsulfonyl)methyl]aniline (16 mg, 0.08 mmol) to give a white solid (12mg, 0.02mmol). MS (ESI)  $m/z = 590 [M+H]^+$ .

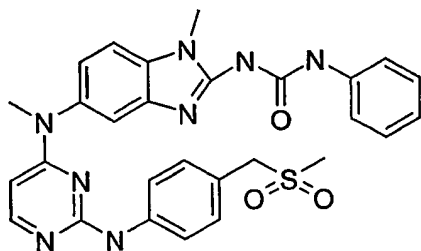
#### Example 141

5 *N*<sup>2</sup>-(5-*tert*-Butyl-isoxazol-3-yl)-1-methyl-*N*<sup>5</sup>- {2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyr imidin-4-yl}-1*H* -benzoimidazole-2,5-diamine

The title compound was prepared following the procedure of Example I with *N*<sup>2</sup>-(5-*tert*-Butyl-isoxazol-3-yl)-*N*<sup>5</sup> -(2-chloro-pyrimidin-4-yl)-1-methyl-1*H* benzoimidazole- 2,5-diamine (35 mg, 0.09 mmol) and 3-(Morpholine-4-sulfonyl)-phenylamine (23 mg, 0.10 mmol) to afford an off white solid (32 mg, 0.005mmol). MS (ESI)  $m/z = 605 [M+H]^+$ .

#### Example 142

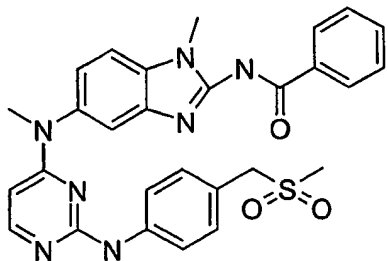
15 *N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1*H*-benzimidazol-2-yl)-*N*'-phenylurea



To a solution of *N*<sup>5</sup>,1-dimethyl-*N*<sup>5</sup>-[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1*H*-benzimidazole-2,5-diamine (150 mg, 0.343 mmol) in *N,N*-dimethylacetamide (3 ml) was added 1,1'-carbonyldiimidazole (167 mg, 1.03 mmol). The mixture was stirred for 24 h and then aniline (192 mg, 2.06 mmol) was added. The mixture was stirred for 2 h. The reaction was quenched with saturated sodium bicarbonate solution (30 ml) and the product precipitated. The crude product was filtered, washed with water, diethyl ether and air dried to give the desired product without further purification. <sup>1</sup>H NMR (300 MHz, *d*<sub>6</sub>-DMSO)  $\delta$  12.14 (s, 1H), 9.26 (s, 1H), 9.12 (s, 1H), 7.86 (d, *J*=5.8Hz, 1H), 7.76-7.68 (m, 4H), 7.42 (d, *J*=8.2 Hz, 1H), 7.30-7.20 (m, 5H), 7.12 (d, *J*=8.2 Hz, 1H), 6.89 (t, *J*=7.1 Hz, 1H), 5.75 (d, *J*=5.7 Hz, 1H), 4.34 (s, 2H), 3.57 (s, 3H), 3.44 (s, 3H), 2.84 (s, 3H). MS (ESI)  $m/z = 557 [M+H]^+$ .

### Example 143

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1*H*-benzimidazol-2-yl)benzamide

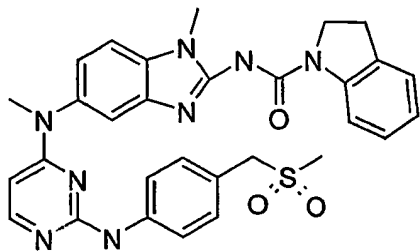


5 To a solution of benzoic acid (51 mg, 0.402 mmol) in *N,N*-dimethylformamide (2 ml) was added 1,1'-carbonyldiimidazole (65.2 mg, 0.400 mmol). The mixture was stirred for 30 minutes at room temperature and then a solution of *N*<sup>5</sup>, 1-dimethyl-*N*<sup>5</sup>-[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1*H*-benzimidazole-2,5-diamine (88 mg, 0.201 mmol) and triethylamine (0.03 ml, 0.201 mmol) in *N,N*-  
10 dimethylformamide (2 ml) was added. The reaction mixture was stirred for 16 h, quenched with saturated sodium bicarbonate solution (30 ml) and the product then precipitated. The crude product was filtered, washed with water, diethyl ether and air dried to give the desired product without further purification. <sup>1</sup>H NMR (400 MHz, *d*<sub>6</sub>-DMSO) δ 12.82 (s, 1H), 9.28 (s, 1H), 8.28 (d, *J*=7.3 Hz, 2H), 7.89 (d, *J*=6.1 Hz, 1H), 7.74  
15 (d, *J*=8.2 Hz, 2H), 7.59 (d, *J*=8.4 Hz, 1H), 7.51-7.44 (m, 4H), 7.25-7.20 (m, 3H), 5.79 (d, *J*=5.9 Hz, 1H), 4.34 (s, 2H), 3.77 (s, 3H), 3.47 (s, 3H), 2.84 (s, 3H). MS (ESI) *m/z* = 542 [M+H]<sup>+</sup>.

20 Examples 144-152 following were prepared in a similar manner as Examples 142 or 143.

### Example 144

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1*H*-benzimidazol-2-yl)indoline-1-carboxamide

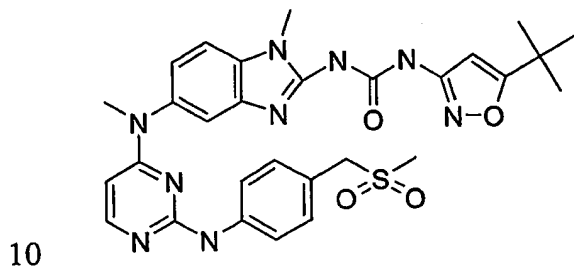


25

<sup>1</sup>H NMR (300 MHz, d<sub>6</sub>-DMSO) δ 12.23 (s, 1H), 9.25 (s, 1H), 7.86 (d, *J*=5.9 Hz, 1H), 7.74 (d, *J*=8.2 Hz, 2H), 7.65 (d, *J*=7.4 Hz, 1H), 7.45 (d, *J*=8.5 Hz, 1H), 7.32 (s, 1H), 7.21–7.12 (m, 5H), 6.85 (m, 1H), 5.75 (d, *J*=6.1 Hz, 1H), 4.33 (s, 2H), 3.60 (s, 3H), 3.48–3.43 (m, 5H), 3.06 (m, 2H), 2.83 (s, 3H). MS (ESI) *m/z* = 583 [M+H]<sup>+</sup>.

#### Example 145

*N*-(5-*tert*-butylisoxazol-3-yl)-*N'*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1*H*-benzimidazol-2-yl)urea



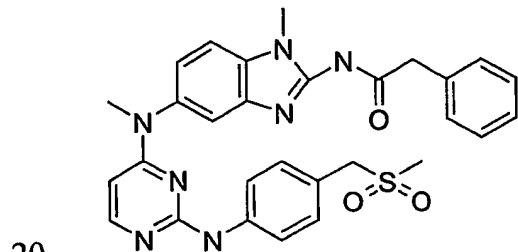
10

<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 12.22 (s, 1H), 9.79 (br s, 1H), 9.28 (s, 1H), 7.88 (d, *J*=5.9 Hz, 1H), 7.75 (d, *J*=8.2 Hz, 2H), 7.46 (d, *J*=8.4 Hz, 1H), 7.31 (br s, 1H), 7.22 (d, *J*=8.4 Hz, 2H), 7.16 (m, 1H), 6.67 (s, 1H), 5.76 (d, *J*=5.9 Hz, 1H), 4.35 (s, 2H), 3.58 (s, 3H), 3.45 (s, 3H), 2.85 (s, 3H), 1.30 (s, 9H). MS (ESI) *m/z* = 604 [M+H]<sup>+</sup>.

15

#### Example 146

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1*H*-benzimidazol-2-yl)-2-phenylacetamide



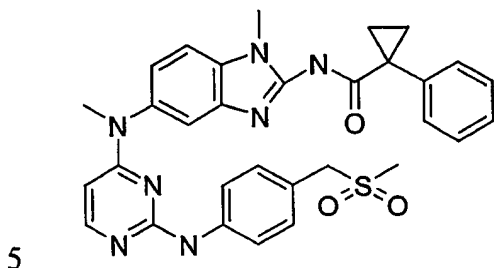
20

<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 10.92 (s, 1H), 9.24 (s, 1H), 7.85 (m, 1H), 7.73 (d, *J*=8.1 Hz, 2H), 7.59 (d, *J*=8.3 Hz, 1H), 7.52 (s, 1H), 7.38–7.29 (m, 5H), 7.19 (m, 3H), 5.75 (d, *J*=4.8 Hz, 1H), 4.34 (s, 2H), 3.81 (s, 3H), 3.58 (s, 3H), 3.48 (s, 3H), 2.84 (s, 3H). MS (ESI) *m/z* = 556 [M+H]<sup>+</sup>.

25

## Example 147

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1*H*-benzimidazol-2-yl)-1-phenylcyclopropanecarboxamide



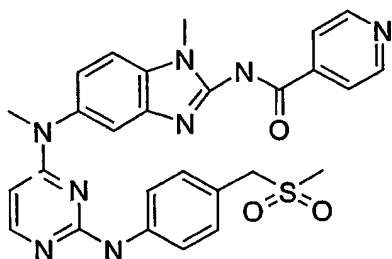
<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 12.44 (s, 1H), 9.26 (s, 1H), 7.87 (d, *J*=6.0 Hz, 1H), 7.72 (d, *J*=8.3 Hz, 2H), 7.45 (d, *J*=8.4 Hz, 1H), 7.38 (d, *J*=7.3 Hz, 2H), 7.31-7.27 (m, 3H), 7.21-7.16 (m, 4H), 5.75 (d, *J*=5.8 Hz, 1H), 4.34 (s, 2H), 3.43 (s, 6H), 2.84 (s, 3H), 1.60 (m, 2H), 1.10 (m, 2H). MS (ESI) *m/z* = 582 [M+H]<sup>+</sup>.

10

## Example 148

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1*H*-benzimidazol-2-yl)isonicotinamide

15



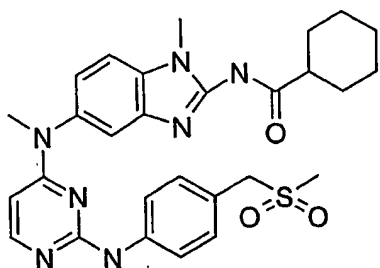
<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 12.92 (s, 1H), 9.29 (s, 1H), 8.75 (d, *J*=5.7 Hz, 2H), 8.11 (d, *J*=5.7 Hz, 2H), 7.90 (d, *J*=6.1 Hz, 1H), 7.74 (d, *J*=8.4 Hz, 2H), 7.64 (d, *J*=8.4 Hz, 1H), 7.47 (s, 1H), 7.29 (m, 1H), 7.21 (d, *J*=8.4 Hz, 2H), 5.81 (d, *J*=5.9 Hz, 1H), 4.34 (s, 2H), 3.80 (s, 3H), 3.48 (s, 3H), 2.85 (s, 3H). MS (ESI) *m/z* = 543 [M+H]<sup>+</sup>.

20

## Example 149

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1*H*-benzimidazol-2-yl)cyclohexanecarboxamide

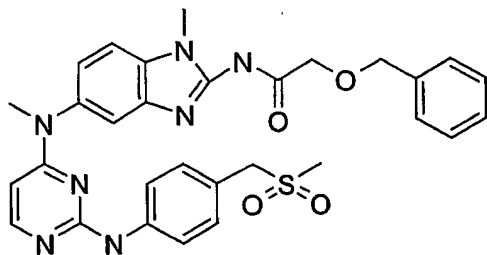
25



<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 10.56 (s, 1H), 9.23 (s, 1H), 7.85 (d, *J*=5.3 Hz, 1H), 7.85 (d, *J*=7.3 Hz, 2H), 7.73 (d, *J*=8.4 Hz, 1H), 7.60 (d, *J*=8.4 Hz, 1H), 7.51 (s, 1H), 7.19-7.18 (m, 3H), 5.81 (d, *J*=4.9 Hz, 1H), 4.34 (s, 2H), 3.60 (s, 3H), 3.48 (s, 3H), 2.85 (s, 3H), 1.92 (m, 2H), 1.77 (m, 2H), 1.66 (m, 1H), 1.47 (m, 2H), 1.36-1.20 (m, 4H). MS (ESI) *m/z* = 548 [M+H]<sup>+</sup>.

#### Example 150

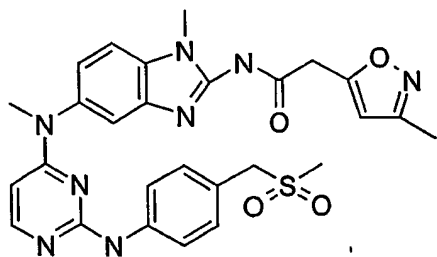
10 2-(benzyloxy)-N-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)acetamide



<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 8.84 (s, 1H), 7.87 (d, *J*=5.5 Hz, 1H), 7.73 (d, *J*=8.6 Hz, 2H), 7.53 (d, *J*=8.0 Hz, 1H), 7.47-7.18 (m, 10H), 5.81 (d, *J*=5.4 Hz, 1H), 4.69 (s, 2H), 4.31 (s, 2H), 3.64 (s, 3H), 3.48 (s, 3H), 3.47 (s, 2H), 2.85 (s, 3H). MS (ESI) *m/z* = 586 [M+H]<sup>+</sup>.

#### Example 151

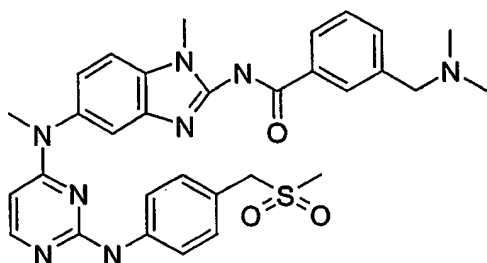
20 2-(3-methylisoxazol-5-yl)-N-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)acetamide



<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 8.84 (s, 1H), 7.88 (d, *J*=6.2 Hz, 1H), 7.72 (d, *J*=8.4 Hz, 2H), 7.53 (d, *J*=8.6 Hz, 1H), 7.46 (s, 1H), 7.23-7.19 (m, 3H), 6.23 (s, 1H), 5.82 (d, *J*=5.7 Hz, 1H), 4.30 (s, 2H), 3.63 (s, 3H), 3.48-3.47 (m, 5H), 2.82 (s, 3H), 2.23 (s, 3H). MS (ESI) *m/z* = 561 [M+H]<sup>+</sup>.

### Example 152

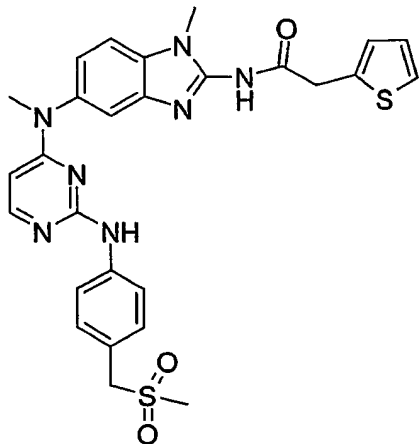
3-[[dimethylamino)methyl]-N-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)benzamide



<sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 8.86 (s, 1H), 8.16-8.14 (m, 2H), 7.89 (d, *J*=5.8 Hz, 1H), 7.74 (d, *J*=8.4 Hz, 2H), 7.55-7.41 (m, 4H), 7.24-7.19 (m, 3H), 5.85 (d, *J*=5.9 Hz, 1H), 4.31 (s, 2H), 3.75 (s, 3H), 3.50 (s, 2H), 3.59 (s, 3H), 2.82 (s, 3H), 2.22 (s, 6H). MS (ESI) *m/z* = 599 [M+H]<sup>+</sup>.

### Example 153

N-{{[3-(4-Methanesulfonylmethyl-phenylamino)-phenyl]-methyl-amino}-methyl-1H-benzimidazol-2-yl}-C-thiophen-2-yl-acetamide



To a solution of {[2-Chloro-pyrimidin-4-yl]-methyl-amino}-methyl-H-benzimidazol-2-yl}-carbamic acid tert-butyl ester (3.88g, 10 mmol) and 4-

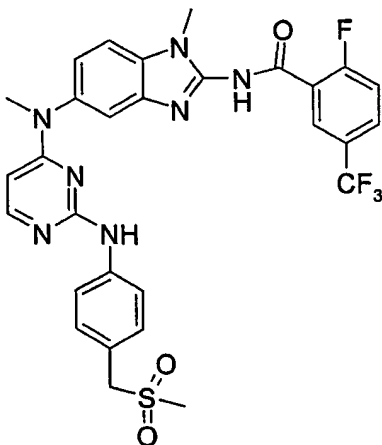
[(methylsulfonyl)methyl]aniline (1.9 g, 12mmol) in isopropanol (100 ml) was added a solution of HCl (1 drop, 4 M in dioxane) and the reaction was heated to 85°C. After 48 hours, the reaction mixture was concentrated in vacuo and neutralized with the addition of saturated NaHCO<sub>3</sub> solution. The mixture was filtered to give N<sup>5</sup>-[3-(4-

5 Methanesulfonylmethyl-phenylamino)-phenyl]-1, N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine as an off white solid, which was used to produce the titled compound.

To a solution of thiophen-2-yl-acetic acid (78 mg, 0.58 mmol) and carbonyldiimidazole (88 mg, 0.55 mmol) in DMF, which was stirred at rt for 15 mins, was added a solution of N<sup>5</sup>-[3-(4-Methanesulfonylmethyl-phenylamino)-phenyl]-1, N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (120 mg, 0.29mmol) and triethylamine (40 µl, 0.29 mmol) in DMF. The reaction mixture was stirred at rt for 16 h and N-({[3-(4-Methanesulfonylmethyl-phenylamino)-phenyl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-C-thiophen-2-yl-acetamide (54 mg, 17 %) was purified with reverse phase HPLC. <sup>1</sup>H NMR (400 MHz, d<sub>6</sub>-DMSO) δ 9.23 (s, 1H), 7.74 – 7.84 (m, 4H), 7.46 – 6.95 (m, 8H), 5.73 (d, J = 5.6 Hz, 1H), 4.35 (s, 2H), 3.91 (s, 2H), 3.60 (s, 3H), 3.46 (s, 3H), 2.85 (s, 3H). MS (ESI) m/z = 562 [M+H]<sup>+</sup>, LC/MS Rt(min) 1.47.

#### Example 154

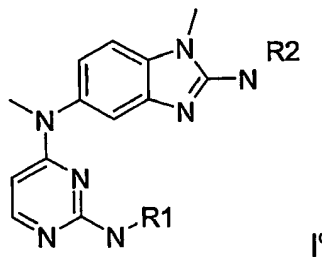
20 C-Fluoro-N-({[3-(3-methanesulfonylmethyl-phenylamino)-phenyl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-trifluoromethyl-benzamide



To a solution of {[2-Chloro-pyrimidin-4-yl]-methyl-amino}-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester (2.86g, 7.4 mmol) and 3-[(methylsulfonyl)methyl]aniline (1.5 g, 8.1mmol) in isopropanol (70 ml) was added a solution of HCl (1 drop, 4 M in dioxane) and the reaction was heated to 70°C. After 16 hours, the reaction mixture was concentrated in vacuo and neutralized with the addition of saturated NaHCO<sub>3</sub> solution. The mixture was filtered to give N<sup>5</sup>-[3-(3-Methanesulfonylmethyl-phenylamino)-phenyl]-1, N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine as an off white solid, which was used to produce the titled compound.

To the solution of N<sup>5</sup>-[3-(3-Methanesulfonylmethyl-phenylamino)-phenyl]-1, N<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine (36 mg, 0.083 mmol) in NMP was added fluoro-trifluoromethyl-benzoyl chloride (38μl, 0.25 mmol). The reaction mixture was stirred at rt for 24 hrs and then purified with Gilson HPLC to give C-Fluoro-N-([3-(3-methanesulfonylmethyl-phenylamino)-phenyl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-trifluoromethyl-benzamide (20mg, 38%). MS (ESI) m/z = 628 [M+H]<sup>+</sup>, LC/MS Rt(min) 2.03.

The following compounds of Examples 155-XXX of Formula I<sup>c</sup> were prepared according to the procedures of Examples 153 or 154 with appropriate starting materials.

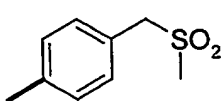
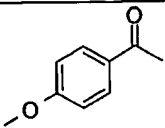
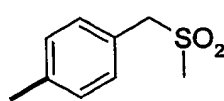
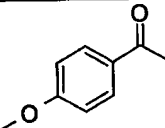
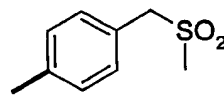
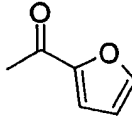
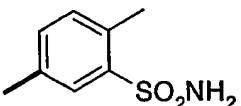
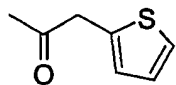
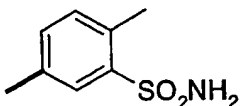
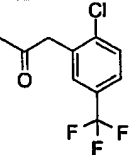
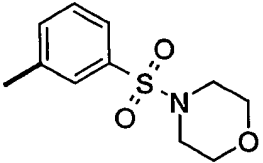
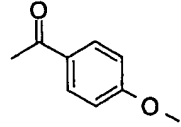
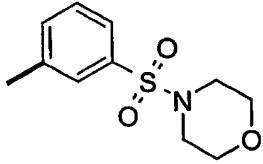
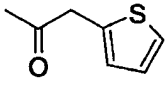
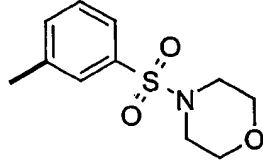
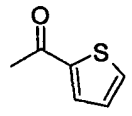
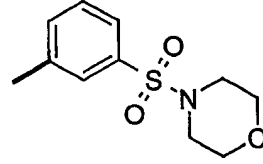
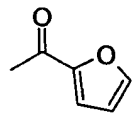
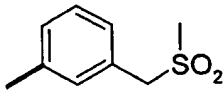
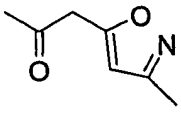
I<sup>c</sup>

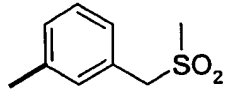
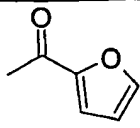
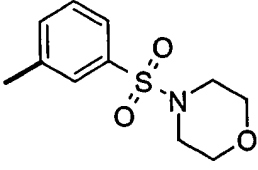
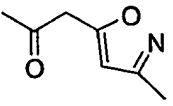
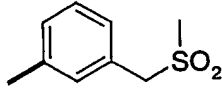
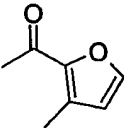
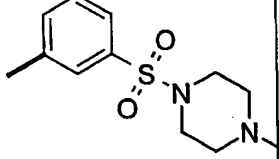
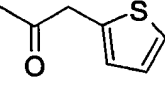
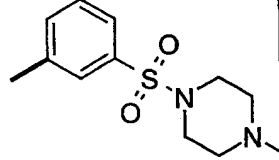
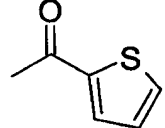
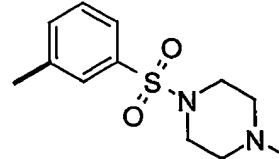
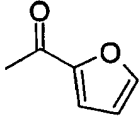
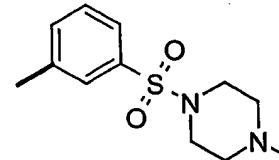
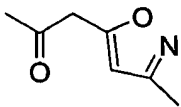
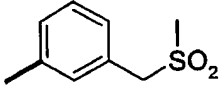
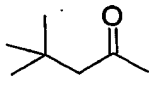
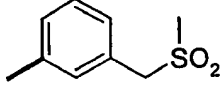
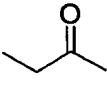
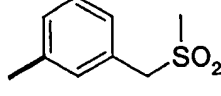
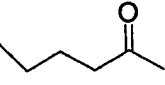
Example	R1	R2	LC/MS Rt (min)	LC/MS (m/z) [M+H] <sup>+</sup>
Example 155			2.32	578



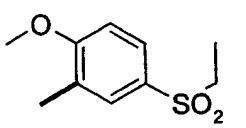
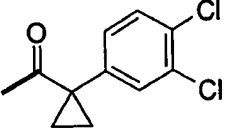
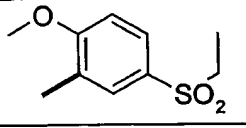
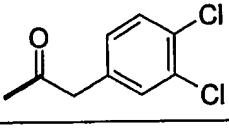
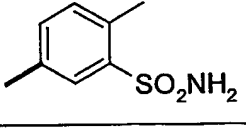
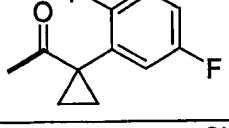
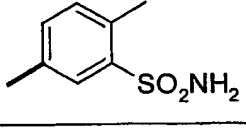
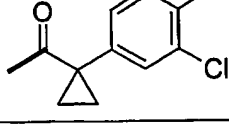
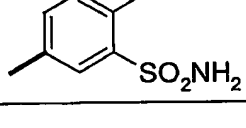
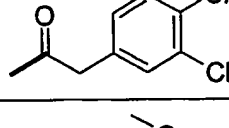
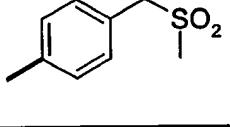
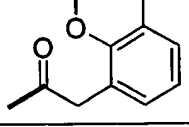
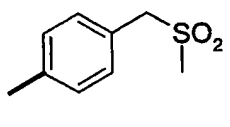
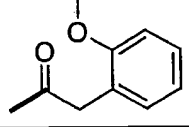
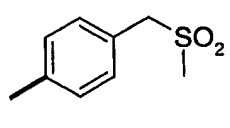
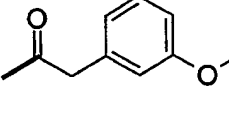
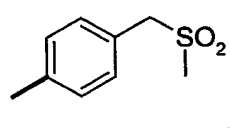
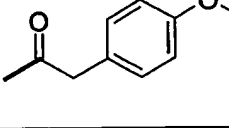
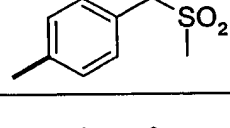
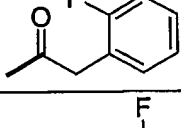
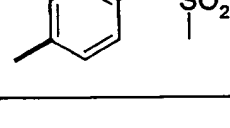
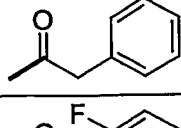
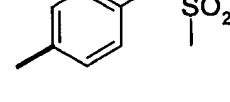
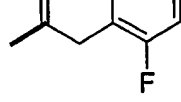
Example 156			2.33	678
Example 157			1.43	548
Example 158			1.80	556
Example 159			1.68	572
Example 160			1.81	658
Example 161			1.90	692
Example 162			1.73	656
Example 163			1.88	692
Example 164			1.66	642
Example 165			1.60	583
Example 166			1.38	582
Example 167			1.77	548

Example 168			1.68	548
Example 169			1.43	562
Example 170			1.84	562
Example 171			1.37	532
Example 172			1.53	546
Example 173			1.26	561
Example 174			1.70	658
Example 175			1.74	656
Example 176			1.54	642
Example 177			1.44	536
Example 178			1.59	564
Example 179			1.22	508
Example 180			1.33	506

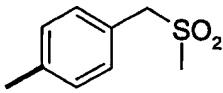
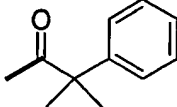
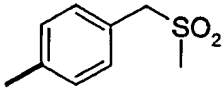
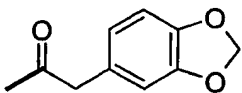
Example 181			1.57	572
Example 182			1.66	573
Example 183			1.35	532
Example 184			1.49	563
Example 185			1.65	660
Example 186			1.82	629
Example 187			1.52	619
Example 188			1.79	605
Example 189			1.58	589
Example 190			1.42	561

Example 191			1.60	532
Example 192			1.51	618
Example 193			1.65	546
Example 194			1.34	632
Example 195			1.53	618
Example 196			1.47	602
Example 197			1.61	631
Example 198			1.36	536
Example 199			1.36	494
Example 200			1.34	522

Example 201			1.29	508
Example 202			1.57	557.2
Example 203			1.65	582.4
Example 204			1.92	618.2
Example 205			1.92	616.0
Example 206			1.67	574.2
Example 207			1.90	691.8
Example 208			1.77	624.0
Example 209			1.77	618.2
Example 210			1.47	592.0
Example 211			1.67	624.2
Example 212			1.89	648.2
Example 213			1.54	622.2

Example 214			2.04	680.2
Example 215			1.72	654.0
Example 216			1.75	619.2
Example 217			1.90	651.2
Example 218			1.62	625.0
Example 219			1.62	615.8
Example 220			1.67	586.2
Example 221			1.65	586.2
Example 222			1.64	586.0
Example 223			1.65	574.2
Example 224			1.75	574.0
Example 225			1.69	592.0

Example 226			1.70	592.0
Example 227			1.42	616.2
Example 228			1.95	593.2
Example 229			2.05	650.2
Example 230			1.64	590.0
Example 231			1.63	590.0
Example 232			1.62	590.0
Example 233			1.59	616.0
Example 234			1.54	615.8
Example 235			1.74	624.0
Example 236			1.77	598.0
Example 237			1.63	583.4

<b>Example 238</b>			1.74	584.0
<b>Example 239</b>			1.45	600.2

**Example 155**

- 5 *Difluoro-N-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-benzamide*

The titled compound was prepared following the procedure of Example 154  
 10 with 3,4-difluoro-benzoyl chloride, 3-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester. MS (ESI)  $m/z$  = 578  $[M+H]^+$ .

**Example 156**

- 15 *N-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-3,5-bis-trifluoromethyl-benzamide*

The titled compound was prepared following the procedure of Example 154  
 20 with Bis-trifluoromethyl-benzoyl chloride, 3-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester. MS (ESI)  $m/z$  = 678  $[M+H]^+$ .

**Example 157**

- 25 *Cyclohexanecarboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide*

The titled compound was prepared following the procedure of Example 154  
 with Cyclohexanecarboxylic acid chloride, 3-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid  
 30 tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 548  $[M+H]^+$ .



**Example 158**

*N-({[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-methyl-benzamide*

5

The titled compound was prepared following the procedure of Example 154 with 3-Methyl-benzoyl chloride, 3-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl]-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 556 [M+H]^+$ .

10

**Example 159**

*N-({[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-4-methoxy-benzamide*

15

The titled compound was prepared following the procedure of Example 153 with 4-Methoxy-benzoic acid, 3-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl]-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester. MS (ESI)  $m/z = 572 [M+H]^+$ .

20

**Example 160**

*C-(Chloro-trifluoromethyl-phenyl)-N-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide*

25

The titled compound was prepared following the procedure of Example 153 with (Chloro-trifluoromethyl-phenyl)-acetic acid, 3-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl]-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester. MS (ESI)  $m/z = 658 [M+H]^+$ .

**Example 161**

30

*(3,5-Bis-trifluoromethyl-phenyl)-N-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide*

The titled compound was prepared following the procedure of Example 153 with 3,5-Bis-trifluoromethyl-acetic acid, 3-[(methylsulfonyl)methyl]aniline and {[2-

Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 692 [M+H]^+$ .

#### Example 162

5 *N*-(5-{[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-2-(3-trifluoromethylsulfonyl-phenyl)-acetamide

The titled compound was prepared following the procedure of Example 153 with (3-Trifluoromethylsulfonyl-phenyl)-acetic acid, 3-[(methylsulfonyl)methyl]aniline  
10 and {[2-(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 656 [M+H]^+$ .

#### Example 163

15 (2,4-Bis-trifluoromethyl-phenyl)-*N*-{[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide

The titled compound was prepared following the procedure of Example 153 with 2,4-Bis-trifluoromethyl-phenyl acetic acid, 3-[(methylsulfonyl)methyl]aniline  
20 and {[2-(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 692 [M+H]^+$ .

#### Example 164

25 (2-Fluoro-5-trifluoromethyl-phenyl)-*N*-{[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide

The titled compound was prepared following the procedure of Example 153 with 2-fluoro-5-trifluoromethyl-phenylacetic acid, 3-[(methylsulfonyl)methyl]aniline  
30 and {[2-(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 642 [M+H]^+$ .

#### Example 165

*3H-Benzotriazole-5-carboxylic acid* {[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide

The titled compound was prepared following the procedure of Example 153 with 3H-Benzotriazole-5-carboxylic acid, 3-[(methanesulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 583  $[M+H]^+$ .

5

#### Example 166

*3H-Benzoimidazole-5-carboxylic acid ([2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-amide*

10 The titled compound was prepared following the procedure of Example 153 with 3H- Benzoimidazole-5-carboxylic acid, 3-[(methanesulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 582  $[M+H]^+$ .

#### 15 Example 167

*Thiophene-2-carboxylic acid ([2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-amide*

20 The titled compound was prepared following the procedure of Example 153 with Thiophene-2-carboxylic acid, 3-[(methanesulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 548  $[M+H]^+$ .

#### Example 168

25 *Thiophene-3-carboxylic acid ([2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-amide*

30 The titled compound was prepared following the procedure of Example 153 with Thiophene-3-carboxylic acid, 3-[(methanesulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 548  $[M+H]^+$ .

#### Example 169

35 *N-([2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-C-thiophen-2-yl-acetamide*

The titled compound was prepared following the procedure of Example 153 with Thiophen-2-yl-acetic acid, 3-[(methanesulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 562 [M+H]^+$ .

#### Example 170

*3-Methyl-thiophene-2-carboxylic acid ([2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-amide*

The titled compound was prepared following the procedure of Example 153 with 3-Methyl-thiophene-2-carboxylic acid, 4-[(methanesulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 562 [M+H]^+$ .

#### Example 171

*Furan-3-carboxylic acid ([2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-amide*

The titled compound was prepared following the procedure of Example 153 with Furan-3-carboxylic acid, 4-[(methanesulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 532 [M+H]^+$ .

#### Example 172

*3-Methyl-furan-2-carboxylic acid ([2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-amide*

The titled compound was prepared following the procedure of Example 153 with 3-Methyl-furan-2-carboxylic acid, 4-[(methanesulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 546 [M+H]^+$ .

#### Example 173

*N-([2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-2-(3-methyl-isoxazol-5-yl)-acetamide*

The titled compound was prepared following the procedure of Example 153 with 3-methyl-isoxazol-5-yl acetic acid, 4-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl]-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 561 [M+H]^+$ .

#### Example 174

*C-(Chloro-trifluoromethyl-phenyl)-N-([2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-acetamide*

The titled compound was prepared following the procedure of Example 153 with 2-Chloro-5-trifluoromethyl-phenyl acetic acid, 4-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl]-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 658 [M+H]^+$ .

#### Example 175

*N-(5-[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-1-methyl-1H-benzoimidazol-2-yl)-2-(3-trifluoromethylsulfanyl-phenyl)-acetamide*

The titled compound was prepared following the procedure of Example 153 with 3-trifluoromethylsulfanyl-phenyl acetic acid, 4-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl]-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 656 [M+H]^+$ .

#### Example 176

*C-(Fluoro-trifluoromethyl-phenyl)-N-([2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-acetamide*

The titled compound was prepared following the procedure of Example 153 with 2-Fluoro-5-trifluoromethyl-phenyl acetic acid, 4-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl]-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 642 [M+H]^+$ .

**Example 177**

*N-([2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-dimethyl-butylamide*

- 5           The titled compound was prepared following the procedure of Example 153 with 3,3-Dimethyl-butylric acid, 4-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 536 [M+H]^+$ .

**10   Example 178**

*2-Propyl-pentanoic acid ([2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-amide*

- 15           The titled compound was prepared following the procedure of Example 153 with 2-Propyl-pentanoic acid, 4-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 564 [M+H]^+$ .

**Example 179**

- 20           *N-([2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-isobutylamide*

- 25           The titled compound was prepared following the procedure of Example 153 with isobutyric acid, 4-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 508 [M+H]^+$ .

**Example 180**

- 30           *Cyclopropanecarboxylic acid ([2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino)-methyl-1H-benzoimidazol-2-yl)-amide*

- 35           The titled compound was prepared following the procedure of Example 153 with Cyclopropanecarboxylic acid, 4-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 506 [M+H]^+$ .

**Example 181**

*N-({[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-4-methoxy-benzamide*

5

The titled compound was prepared following the procedure of Example 153 with 4-methoxy-benzoic acid, 4-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 572$   $[M+H]^+$ .

10

**Example 182**

*4-Methoxy-N-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-benzamide*

15

The titled compound was prepared following the procedure of Example 153 with 4-methoxy-benzoic acid, 5-Amino-2-methyl-benzenesulfonamide and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 573$   $[M+H]^+$ .

20

**Example 183**

*Furan-2-carboxylic acid: ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide*

The titled compound was prepared following the procedure of Example 153 with Furan-2-carboxylic acid, 4-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 532$   $[M+H]^+$ .

25

**Example 184**

*N-(Methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-C-thiophen-2-yl-acetamide*

30

The titled compound was prepared following the procedure of Example 153 with thiophen-2-yl-acetic acid, 5-Amino-2-methyl-benzenesulfonamide and {[2-

Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 563 [M+H]^+$ .

#### Example 185

5 *C-(Chloro-trifluoromethyl-phenyl)-N-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-acetamide*

The titled compound was prepared following the procedure of Example 153 with 2-Chloro-5-trifluoromethyl-phenyl acid, 5-Amino-2-methyl-benzenesulfonamide  
10 and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 660 [M+H]^+$ .

#### Example 186

15 *4-Methoxy-N-[methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-benzamide*

The titled compound was prepared following the procedure of Example 153 with 4-Methoxy benzoic acid, 3-(Morpholine-4-sulfonyl)-phenylamine and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid  
20 tert-butyl ester in pyridine. MS (ESI)  $m/z = 629 [M+H]^+$ .

#### Example 187

25 *N-[Methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-C-thiophen-2-yl)-acetamide*

The titled compound was prepared following the procedure of Example 153 with thiophen-2-yl-acetic acid, 3-(Morpholine-4-sulfonyl)-phenylamine and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid  
30 tert-butyl ester in pyridine. MS (ESI)  $m/z = 619 [M+H]^+$ .

#### Example 188

*Thiophene-2-carboxylic acid [methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-amide*



The titled compound was prepared following the procedure of Example 153 with Thiophene-2-carboxylic acid, 3-(Morpholine-4-sulfonyl)-phenylamine and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 605  $[M+H]^+$ .

5

#### Example 189

*Furan-2-carboxylic acid [methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide*

10 The titled compound was prepared following the procedure of Example 153 with Furan-2-carboxylic acid, 3-(Morpholine-4-sulfonyl)-phenylamine and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 589  $[M+H]^+$ .

#### 15 Example 190

*N-({[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-2-(3-methyl-isoxazol-5-yl)-acetamide*

20 The titled compound was prepared following the procedure of Example 153 with 3-methyl-isoxazol-5-yl acetic acid, 3-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 561  $[M+H]^+$ .

#### Example 191

25 *Furan-2-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide*

30 The titled compound was prepared following the procedure of Example 153 with Furan-2-carboxylic acid, 3-[(methylsulfonyl)methyl]aniline and {[2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 532  $[M+H]^+$ .

#### Example 192

35 *2-(3-Methyl-isoxazol-5-yl)-N-[methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-acetamide*

The titled compound was prepared following the procedure of Example 153 with 3-Methyl-isoxazol-5-yl acetic acid, 3-(Morpholine-4-sulfonyl)-phenylamine and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 618 [M+H]^+$ .

#### Example 193

*3-Methyl-furan-2-carboxylic acid* ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide

The titled compound was prepared following the procedure of Example 153 with 3-Methyl-furan-2-carboxylic acid, 3-[(methylsulfonyl)methyl]aniline and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 546 [M+H]^+$ .

#### Example 194

*N-[Methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-C-thiophen-2-yl-acetamide*

The titled compound was prepared following the procedure of Example 153 with thiophen-2-yl-acetic acid, 3-(4-Methyl-piperazine-1-sulfonyl)-phenylamine and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 632 [M+H]^+$ .

#### Example 195

*Thiophene-2-carboxylic acid* [methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide

The titled compound was prepared following the procedure of Example 153 with Thiophene-2-carboxylic acid, 3-(4-Methyl-piperazine-1-sulfonyl)-phenylamine and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 618 [M+H]^+$ .

#### Example 196

*Furan-2-carboxylic acid [methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide*

The titled compound was prepared following the procedure of Example 153 with Furan-2-carboxylic acid, 3-(4-Methyl-piperazine-1-sulfonyl)-phenylamine and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 602 [M+H]^+$ .

#### Example 197

2-(3-Methyl-isoxazol-5-yl)-N-[methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-acetamide

The titled compound was prepared following the procedure of Example 153 with 3-Methyl-isoxazol-5-yl acetic acid, 3-(4-Methyl-piperazine-1-sulfonyl)-phenylamine and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 631 [M+H]^+$ .

#### Example 198

N-({[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-dimethyl-butyramide

The titled compound was prepared following the procedure of Example 153 with 3,3-Dimethyl-butyric acid, 3-[(methylsulfonyl)methyl]aniline and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 536 [M+H]^+$ .

#### Example 199

N-({[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-propionamide

The titled compound was prepared following the procedure of Example 153 with propionic acid, 3-[(methylsulfonyl)methyl]aniline and {[(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z = 494 [M+H]^+$ .

### Example 200

*Pentanoic acid* ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide

The titled compound was prepared following the procedure of Example 153 with Pentanoic acid, 3-[(methanesulfonyl)methyl]aniline and {[2-(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 522  $[M+H]^+$ .

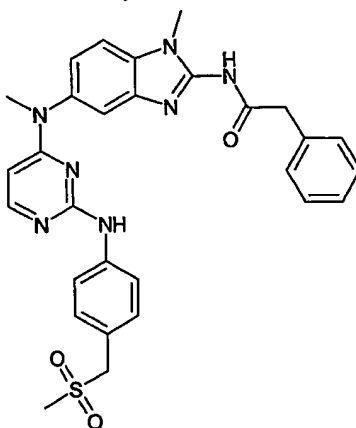
### Example 201

*N-({[2-(3-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-butyramide*

The titled compound was prepared following the procedure of Example 153 with Butyric acid, 3-[(methanesulfonyl)methyl]aniline and {[2-(2-Chloro-pyrimidin-4-yl)-methyl-amino]-methyl-H-benzoimidazol-2-yl}-carbamic acid tert-butyl ester in pyridine. MS (ESI)  $m/z$  = 508  $[M+H]^+$ .

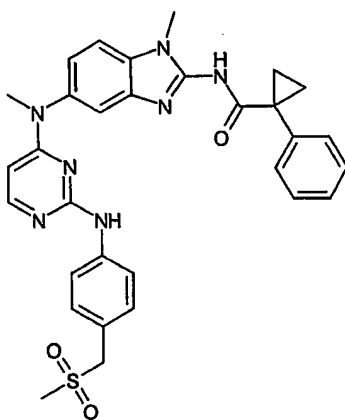
### Example 202

*Phenyl- N -({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H -benzoimidazol-2-yl)-acetamide*



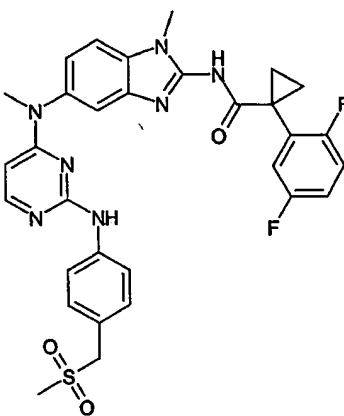
### Example 203

*Phenylcyclopropanecarboxylic acid* ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide



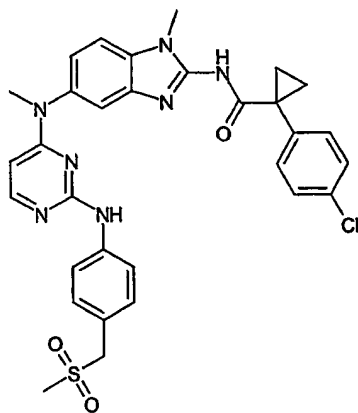
### Example 204

5 *1-(2,5-Difluoro-phenyl)-cyclopropanecarboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H -benzoimidazol-2-yl)-amide*



### 10 Example 205

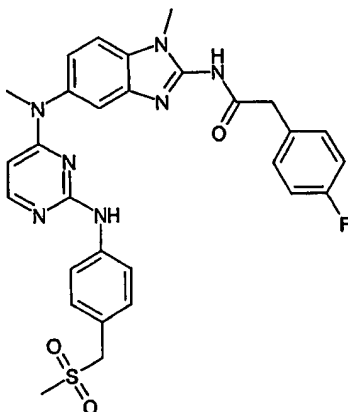
*1-(4-Chloro-phenyl)-cyclopropanecarboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H -benzoimidazol-2-yl)-amide*



15

### Example 206

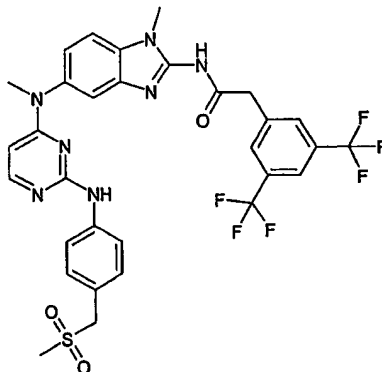
2-(4-Fluoro-phenyl)- N -({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H -benzoimidazol-2-yl)-acetamide



5

### Example 207

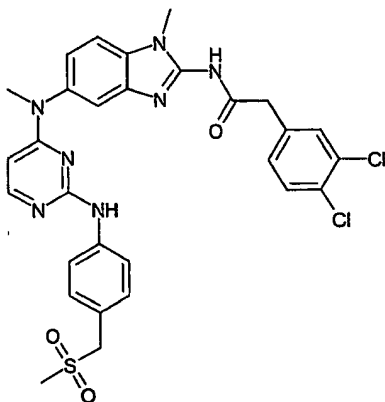
(3,5-Bistrifluoromethyl-phenyl)- N -({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1 H -benzoimidazol-2-yl)-acetamide



10

### Example 208

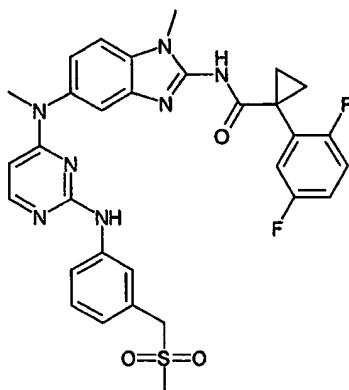
(3,4-Dichlorophenyl)- N -({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1 H -benzoimidazol-2-yl)-acetamide



15

### Example 209

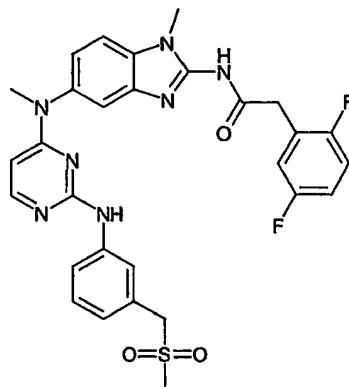
1-(2,5-Difluorophenyl)-cyclopropanecarboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide



5

### Example 210

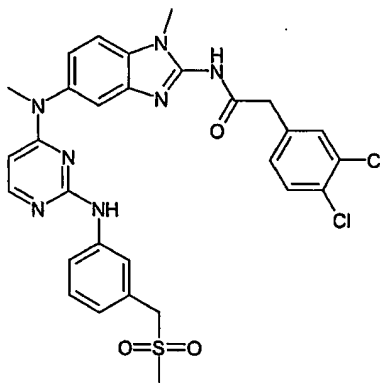
(2,5-Difluorophenyl)- N -({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



10

### Example 211

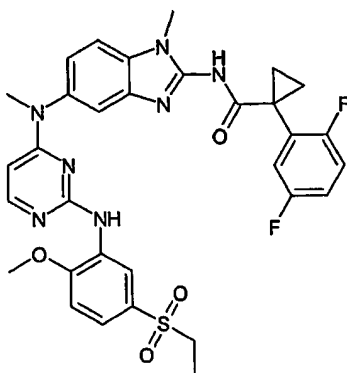
(3,4-Dichlorophenyl)- N -({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



15

### Example 212

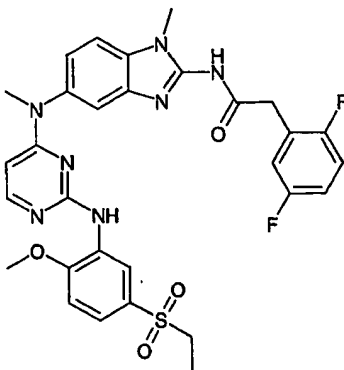
1-(2,5-Difluorophenyl)-cyclopropanecarboxylic acid ({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H -benzoimidazol-2-yl)-amide



5

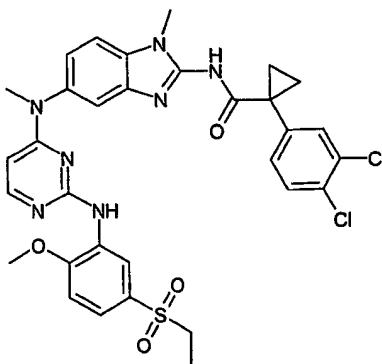
### Example 213

10 (2,5-Difluorophenyl)- N -({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino }-methyl-1H -benzoimidazol-2-yl)-acetamide



### Example 214

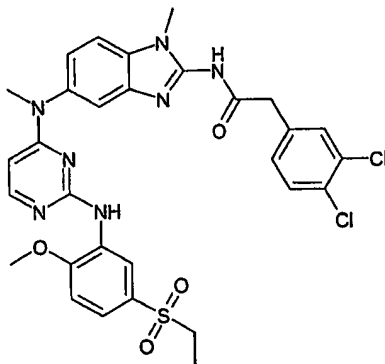
15 1-(3,4-Dichlorophenyl)-cyclopropanecarboxylic acid ({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H -benzoimidazol-2-yl)-amide





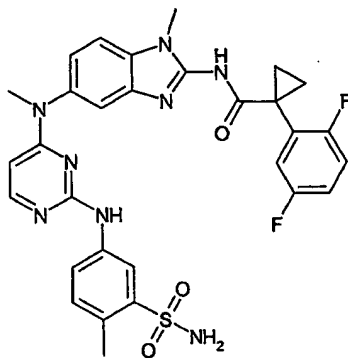
### Example 215

*3,4-Dichlorophenyl- N-({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide*



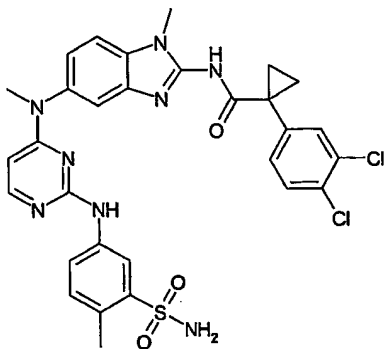
### 5 Example 216

*1-(2,5-Difluorophenyl)-cyclopropanecarboxylic acid (methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-amide*



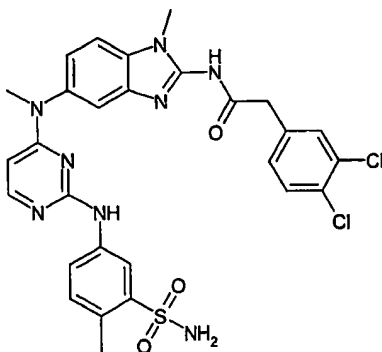
### 10 Example 217

*1-(3,4-Dichlorophenyl)-cyclopropanecarboxylic acid (methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-amide*



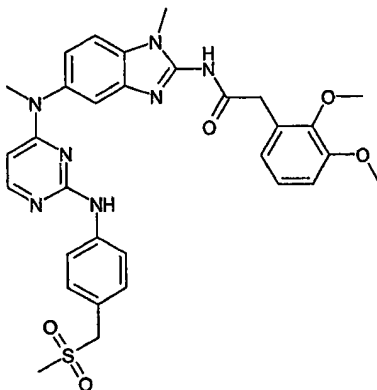
### 15 Example 218

*(3,4-Dichlorophenyl)- N-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-acetamide*



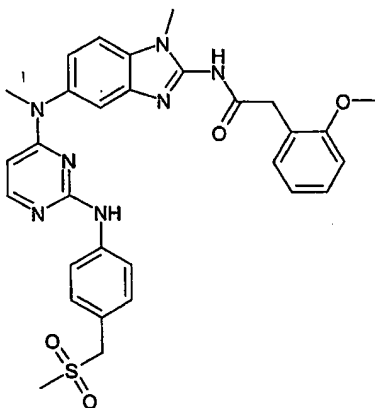
### Example 219

- 5 2-(2,3-Dimethoxyphenyl)-N-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzimidazol-2-yl)-acetamide



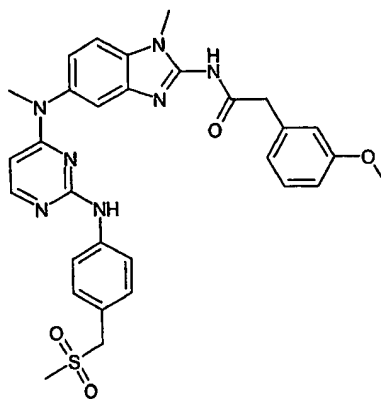
### Example 220

- 10 2-(2-Methoxyphenyl)-N-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzimidazol-2-yl)-acetamide



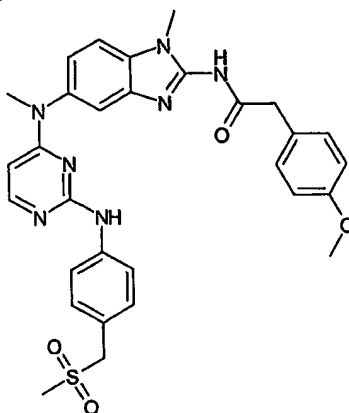
### Example 221

- 15 2-(3-Methoxyphenyl)-N-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzimidazol-2-yl)-acetamide



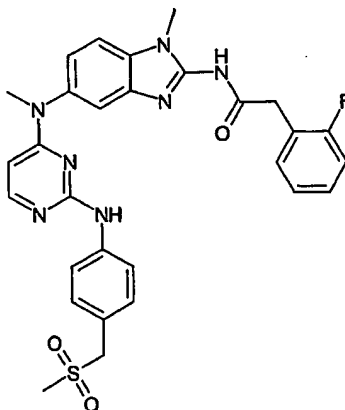
### Example 222

- 5 2-(3-Methoxyphenyl)-N-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide



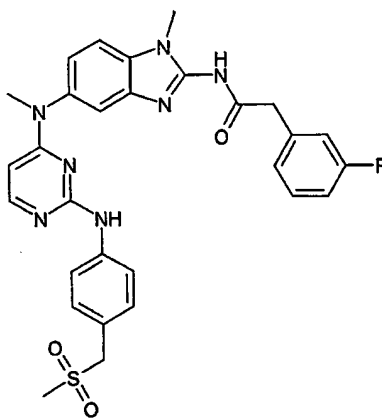
### Example 223

- 10 2-(2-Fluorophenyl)-N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



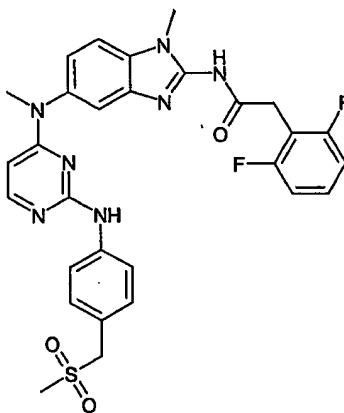
### Example 224

- 15 2-(3-Fluorophenyl)-N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



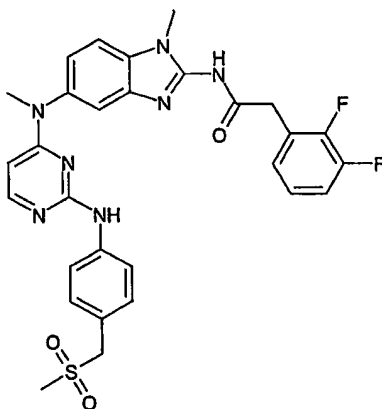
### Example 225

5 (2,5-Difluorophenyl)- N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



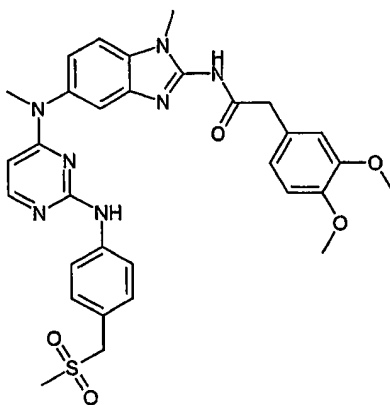
### Example 226

10 (2,3-Difluorophenyl)- N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



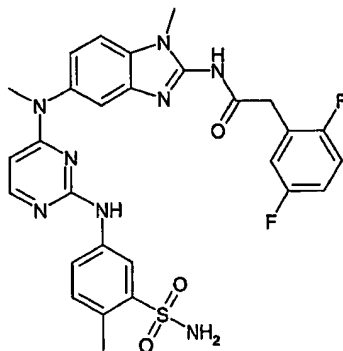
### Example 227

15 2-(3,4-Dimethoxyphenyl)- N-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide



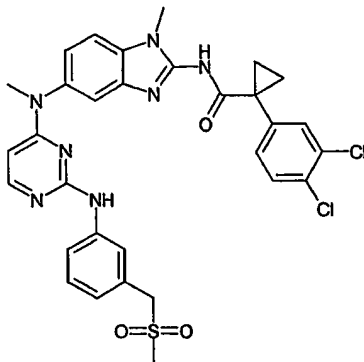
### Example 228

5 (2,5-Difluorophenyl)- N-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-acetamide



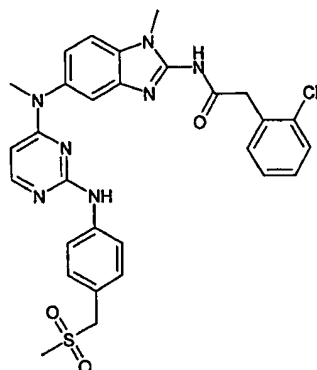
### Example 229

10 1-(3,4-Dichloro-phenyl)-cyclopropanecarboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide



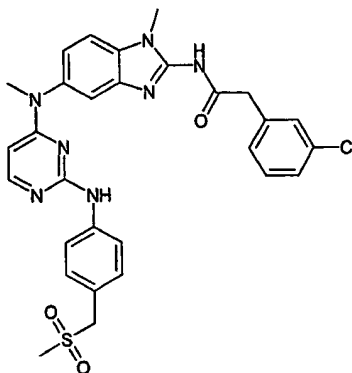
### Example 230

15 2-(2-Chlorophenyl)- N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



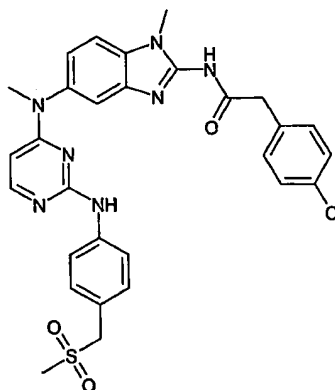
### Example 231

5 2-(3-Chlorophenyl)- N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



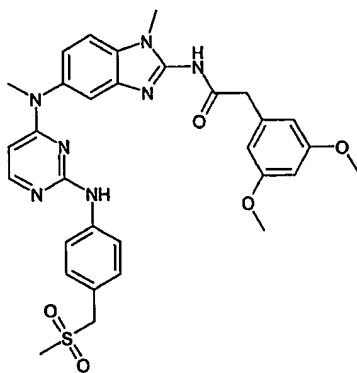
### Example 232

10 2-(4-Chlorophenyl)- N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



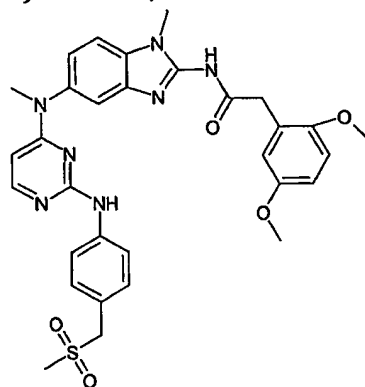
### Example 233

15 2-(3,5-Dimethoxyphenyl)- N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide



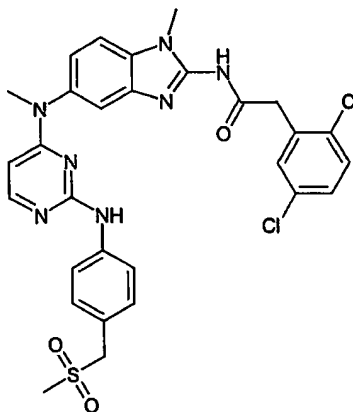
### Example 234

2-(2,5-Dimethoxyphenyl)- N-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-  
pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide



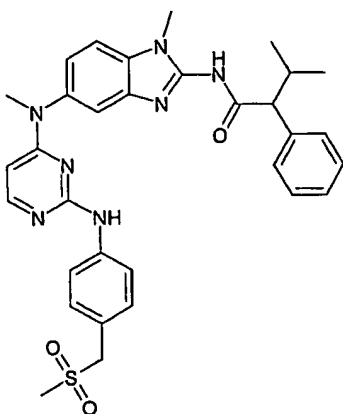
### Example 235

(2,5-Dichlorophenyl)- N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-  
yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



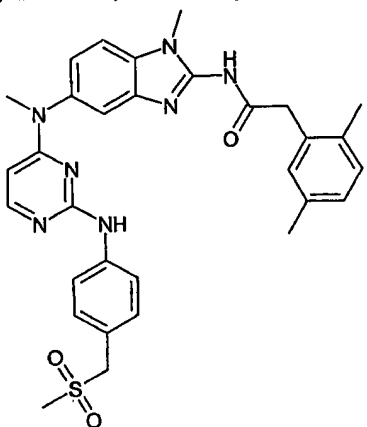
### Example 236

N-({[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-  
methyl-1H-benzoimidazol-2-yl)-methyl-C-phenyl-butylamide



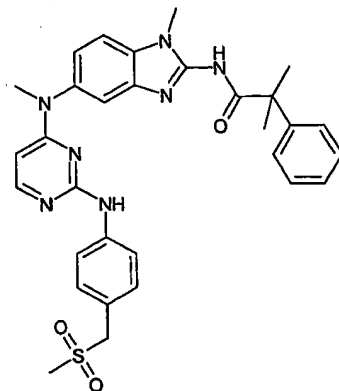
### Example 237

- 5 (3,5-Dimethylphenyl)- N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide



### Example 238

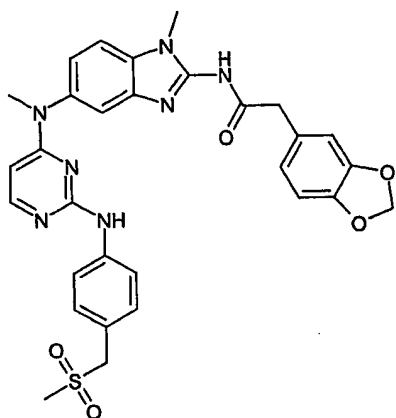
- 10 N-({[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-phenyl-isobutyramide



### Example 239

- 15 Benzo[1,3]dioxol-5-yl-N-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide





## BIOLOGICAL DATA

5

### *Tie2 fluorescence polarization kinase activity assay: (TIE2-FP)*

#### *Activation of recombinant Tie2 activation:*

Recombinant GST-Tie2 was activated by incubating the enzyme in 20mM Tris-HCl, pH 7.5, 12mM MgCl<sub>2</sub>, 100mM NaCl, 20μM sodium vanadate, 1mM DTT and 300μM ATP at room temperature for 2 hours. The activation mixture was then passed through a NAP-25 desalting column (Pharmacia Biotech cat. no. 17-0852-02) to remove the free ATP. The activated enzyme was stored as aliquots at -80°C in 20mM Tris-HCl, pH 7.5 and 100mM NaCl.

#### *Assay conditions:*

The final assay conditions were 50mM HEPES, pH 7.5, 5% DMSO (when screening compounds), 200μM ATP, 5mM MgCl<sub>2</sub>, 1mM DTT, 50μM sodium vanadate, 1nM activated enzyme, and 200μM peptide. IC<sub>50</sub>'s of compounds were measured under subsaturating ATP (200μM) and varying concentrations of activated Tie2 and peptide substrate (RFWKYEFWR-OH; MW 1873 Da, TFA salt). Panvera Anti-phosphotyrosine antibody (Cat#P2840) and PTK Green Tracer (Cat#P2842) were used to detect the phosphorylated peptide. Polarization was measured on a TECAN Polarion in 138-second cycles for 30 minutes at room temperature. IC<sub>50</sub>'s were then determined from the % polarization using normal calculation methods. Results are indicated below.

25

### *VEGF-R2 enzyme assay (VEGF-E)*

The VEGF enzyme assay used the LANCE method (Wallac) and GST-VEGFR2, baculovirus expressed recombinant constructs of the intracellular domains of human TIE2 tagged by GST. The method measured the ability of the purified enzymes to catalyse the transfer of the  $\gamma$ -phosphate from ATP onto tyrosine residues in a biotinylated synthetic peptide, (biotin-aminohexyl-EEEEYFELVAKKKK-NH<sub>2</sub>). This peptide phosphorylation was detected using the following procedure: GST-VEGFR2 was incubated for 40–60 mins at room temperature with 75  $\mu$ M ATP, 5 mM MgCl<sub>2</sub>, 0.1 mM DTT, 0.1 mg/mL BSA and the test compound (diluted from a 10 mM stock in DMSO for desired concentration) in 100 mM HEPES buffer. The reaction was stopped by the addition of EDTA (final concentration 50 mM). Streptavidin linked-APC (allophycocyanin, Molecular Probe) and Europium-labeled anti-phosphorylated tyrosine antibody (Wallac) were then added at the final concentration of 15 nM and 1 nM, respectively. The APC signal was measured using an ARVO multilabel counter (Wallac Berthold, Japan). The percent inhibition of activity was calculated relative to blank control wells. The concentration of test compound that inhibits 50% of activity (IC<sub>50</sub>) was interpolated using nonlinear regression (Levenberg-Marquardt) and the equation,  $y = V_{max} (1 - x / (K + x)) + Y_2$ , where "K" was equal to the IC<sub>50</sub>. The IC<sub>50</sub> values were converted to pIC<sub>50</sub> values, i.e.,  $-\log IC_{50}$  in Molar concentration. The results are represented in Table 1 below.

***VEGF-driven cellular proliferation assay: BrdU incorporation assay (VEGF-C)***

Human umbilical cord endothelial cells (HUVEC, Clonetics, CC2519) were passaged in Type I collagen-coated 100-mm petridishes in EGM-MV medium (Clonetics, CC3125) at 37°C in a humidified 5% CO<sub>2</sub>, 95% air incubator. (HUVEC passaged more than 6 times in vitro were discarded and not subjected to assaying.) The cells were harvested using trypsin/EDTA, counted using a haemocytometer and plated at 5000 cells/well in a Type I-collagen coated 96-well plate (Becton Dickinson, 354407) in M199 medium (Gibco BRL, 12340-030) containing 5% FBS (Hyclone, A 1115-L) and gentamicin (at 50  $\mu$ g/ml, Gibco BRL). After incubation overnight at 37°C, the media were replaced with 100  $\mu$ l of M199 serum-free medium containing

compounds at various concentrations with 0.6% DMSO and gentamicin. The compounds were diluted in serum-free M199 medium from 10mM stock solutions prepared in 100% DMSO. After a 30 min incubation at 37°C, the cells were fed with 100 ul of serum-free M199 medium containing gentamicin, 0.2% culture-grade  
5 bovine serum albumin (BSA, Sigma A1993) and 20 ng/ml of VEGF (R&D systems, 293-VE) or 0.6 ng/ml of basic FGF (R&D systems, 233-FB), and cultured at 37°C for another 24 h. The cells were pulsed with bromodeoxyuridine (BrdU at 10 uM in serum-free M199) at 37°C for an additional 24 h. The incorporation of BrdU into the proliferating HUVEC were analyzed using BrdU Cell Proliferation ELISA (Roche Molecular  
10 Biochemicals, 1647229) according to the manufacturer's protocols. The optical density at 450 nm was measured with a multilabel counter (ARVO SX, Wallac). The percent inhibition of cell growth was calculated relative to blank control wells. The concentration of test compound that inhibits 50% of cell growth (IC<sub>50</sub>) was interpolated using nonlinear regression (Levenberg-Marquardt) and the equation,  $y = V_{max} (1-x/(K+x)) + Y_2$ , where "K" was equal to the IC<sub>50</sub>. The IC<sub>50</sub> values were converted to pIC<sub>50</sub> values, i.e., -log IC<sub>50</sub> in Molar concentration. The results are represented in Table 1 below.

TABLE I

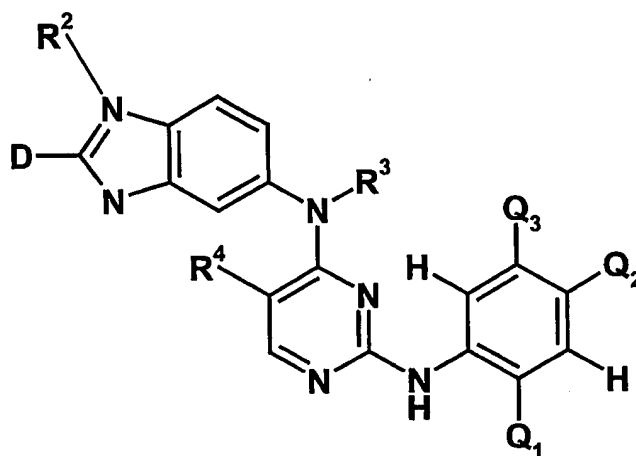
Ex. No	TIE2-FP	VEGF-E	VEGF-C
1		+++	+++
2		+++	+++
3		+++	+++
4		+++	+++
5		+++	+++
6		+++	+++
11		+++	
90		+++	
92	+	++	
95	++	+++	
110	+++	+++	
112	+++	+++	
117	+	+++	
118	++	+++	
124	++	+++	
125	+++	+++	
135	+	+++	
136	+	+++	
142		+++	
153	+	+++	
156		++	
157		+++	
161	+	++	
162	+	+++	
167	+	+++	
169	+	+++	
173	+	+++	
177	+	+++	
202		+++	
203	+++	+++	
204	+	++	
206	+	+++	
219		+++	
226	+	+++	
229	+	++	
230	+	+++	
239		++	

+ = pIC<sub>50</sub> of 5.0 – 6.0; ++ = pIC<sub>50</sub> of 6.0 – 7.0; +++ = pIC<sub>50</sub> of > 7.0;

## CLAIMS

We claim:

1. A compound of Formula (I):



(I)

or a salt, solvate, or physiologically functional derivative thereof:

wherein:

$D$  is  $-NRR^1$ ,  $-OR$ ,  $-SR$ ,  $-S(O)R$ , or  $-S(O)_2R$ ;

$R$  is hydrogen,  $C_1$ - $C_8$  alkyl,  $C_3$ - $C_7$  cycloalkyl, aralkyl, aryl, heteroaryl,  $-C(O)NR^1R^1$ ,  $-C(O)OR^1$ , acyl, aroyl, or heteroaroyl;

$R^1$  is hydrogen,  $C_1$ - $C_8$  alkyl,  $C_3$ - $C_7$  cycloalkyl, aralkyl, or aryl;

$R^2$  is  $C_1$ - $C_6$  alkyl or  $C_3$ - $C_7$  cycloalkyl;

$R^3$  is hydrogen,  $C_1$ - $C_4$  alkyl,  $C_1$ - $C_4$  haloalkyl, aralkyl, cyanoalkyl,

$-(CH_2)_pC=CH(CH_2)_tH$ ,  $-(CH_2)_pC\equiv C(CH_2)_tH$ , or  $C_3$ - $C_7$  cycloalkyl;

$p$  is 1, 2, or 3;

$t$  is 0 or 1;

$R^4$  is hydrogen, halo, or cyano;

$Q_1$  is hydrogen, halo,  $C_1$ - $C_2$  haloalkyl,  $C_1$ - $C_2$  alkyl,  $C_1$ - $C_2$  alkoxy, or  $C_1$ - $C_2$  haloalkoxy;

$Q_2$  is  $A^1$  or  $A^2$ ;

$Q_3$  is  $A^1$  when  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^2$  when  $Q_2$  is  $A^1$ ;

wherein

$A^1$  is hydrogen, halo,  $C_1$ - $C_3$  alkyl,  $C_1$ - $C_3$  haloalkyl,  $-OR^5$ , and

$A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein

$Z$  is  $CH_2$  and  $m$  is 0, 1, 2, or 3, or

$Z$  is  $NR^5$  and  $m$  is 0 or 1, or

$Z$  is oxygen and  $m$  is 0 or 1, or

$Z$  is  $CH_2NR^6$  and  $m$  is 0 or 1;

$Z^1$  is  $S(O)_2$ ,  $S(O)$ , or  $C(O)$ ; and

$Z^2$  is  $C_1$ - $C_4$  alkyl, cycloalkyl, heterocyclyl,  $-NR^8R^9$ , aryl, arylamino, aralkyl, aralkoxy, or heteroaryl;

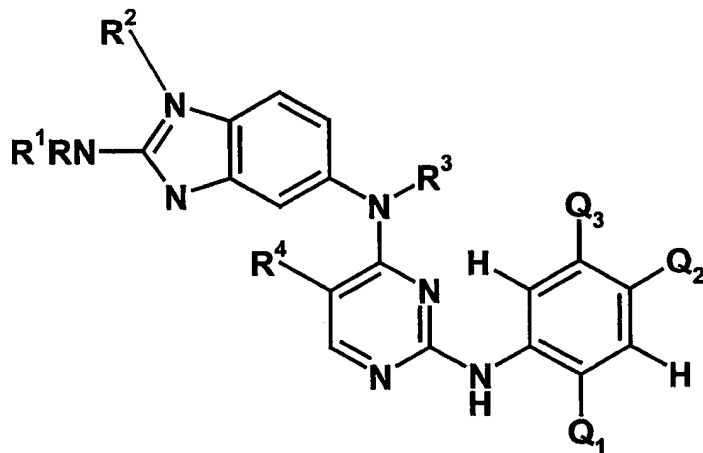
$R^5$  and  $R^6$  are each independently selected from hydrogen, hydroxyl, alkoxy, aryloxy, aralkoxy,  $C_1$ - $C_4$  alkyl,  $C_3$ - $C_7$  cycloalkyl, heterocyclyl,  $-S(O)_2R^7$ , and  $-C(O)R^7$ ;

$R^7$  is  $C_1$ - $C_4$  alkyl, or  $C_3$ - $C_7$  cycloalkyl;

$R^8$  is hydrogen, hydroxyl,  $C_1$ - $C_6$  alkyl,  $C_1$ - $C_6$  alkoxy, aryloxy, aralkoxy,  $C_3$ - $C_7$  cycloalkyl, and  $C_3$ - $C_7$  cycloalkoxy; and

$R^9$  is hydrogen,  $C_1$ - $C_6$  alkyl,  $C_3$ - $C_7$  cycloalkyl, aryl, acyl, carbamoyl, or heterocyclyl.

2. A compound of Formula (II):



(II)

or a salt, solvate, or physiologically functional derivative thereof:

wherein:

$R$  is hydrogen,  $C_1$ - $C_8$  alkyl,  $C_3$ - $C_7$  cycloalkyl, aralkyl, aryl, heteroaryl,  $-C(O)NR^1R^1$ ,  $-C(O)OR^1$ , acyl, aroyl, or heteroaroyl;

$R^1$  is hydrogen,  $C_1$ - $C_8$  alkyl,  $C_3$ - $C_7$  cycloalkyl, aralkyl, or aryl;

$R^2$  is  $C_1$ - $C_6$  alkyl or  $C_3$ - $C_7$  cycloalkyl;

$R^3$  is hydrogen,  $C_1$ - $C_4$  alkyl,  $C_1$ - $C_4$  haloalkyl, aralkyl, cyanoalkyl,

$-(CH_2)_pC=CH(CH_2)_tH$ ,  $-(CH_2)_pC\equiv C(CH_2)_tH$ , or  $C_3$ - $C_7$  cycloalkyl;

$p$  is 1, 2, or 3;

$t$  is 0 or 1;

$R^4$  is hydrogen, halo, or cyano;

$Q_1$  is hydrogen, halo,  $C_1$ - $C_2$  haloalkyl,  $C_1$ - $C_2$  alkyl,  $C_1$ - $C_2$  alkoxy, or  $C_1$ - $C_2$  haloalkoxy;

$Q_2$  is  $A^1$  or  $A^2$ ;

$Q_3$  is  $A^1$  when  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^2$  when  $Q_2$  is  $A^1$ ;

wherein

$A^1$  is hydrogen, halo,  $C_1$ - $C_3$  alkyl,  $C_1$ - $C_3$  haloalkyl,  $-OR^5$ , and

$A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein

$Z$  is  $CH_2$  and  $m$  is 0, 1, 2, or 3, or

$Z$  is  $NR^5$  and  $m$  is 0 or 1, or

$Z$  is oxygen and  $m$  is 0 or 1, or

$Z$  is  $CH_2NR^6$  and  $m$  is 0 or 1;

$Z^1$  is  $S(O)_2$ ,  $S(O)$ , or  $C(O)$ ; and

$Z^2$  is  $C_1$ - $C_4$  alkyl, cycloalkyl, heterocyclyl,  $-NR^8R^9$ , aryl, arylamino, aralkyl, aralkoxy, or heteroaryl;

$R^5$  and  $R^6$  are each independently selected from hydrogen, hydroxyl, alkoxy, aryloxy, aralkoxy,  $C_1$ - $C_4$  alkyl,  $C_3$ - $C_7$  cycloalkyl, heterocyclyl,  $-S(O)_2R^7$ , or  $-C(O)R^7$ ;

$R^7$  is  $C_1$ - $C_4$  alkyl, or  $C_3$ - $C_7$  cycloalkyl;

$R^8$  is hydrogen, hydroxyl,  $C_1$ - $C_6$  alkyl,  $C_1$ - $C_6$  alkoxy, aryloxy, aralkoxy,  $C_3$ - $C_7$  cycloalkyl, or  $C_3$ - $C_7$  cycloalkoxy; and

$R^9$  is hydrogen,  $C_1$ - $C_6$  alkyl,  $C_3$ - $C_7$  cycloalkyl, aryl, acyl, carbamoyl, or heterocyclyl.

3. A compound as claimed in claim 1, wherein  $D$  is  $-NRR^1$ .

4. A compound as claimed in claim 1, wherein D is  $-NRR^1$  and R is  $C_1-C_8$  alkyl, aryl, or aralkyl and  $R^1$  is hydrogen.
5. A compound as claimed in claim 1, wherein D is  $-NRR^1$ , wherein R is methyl, isopropyl, benzyl, or phenyl and  $R^1$  is hydrogen.
6. A compound as claimed in claim 1 or 2, wherein  $R^2$  is  $C_1-C_8$  alkyl
7. A compound as claimed in claim 1 or 2, wherein  $R^2$  is methyl.
8. A compound as claimed in claim 1 or 2, wherein In one embodiment,  $R^3$  is hydrogen,  $C_1-C_4$  alkyl, cyanoalkyl, or  $-(CH_2)_pC\equiv C(CH_2)_tH$ .
9. A compound as claimed in claim 1 or 2, wherein,  $R^3$  is hydrogen, methyl, ethyl, isopropyl, cyanomethyl, or  $-(CH_2)_pC\equiv C(CH_2)_tH$ , wherein p is 1 and t is 0.
10. A compound as claimed in claim 1 or 2, wherein  $R^3$  is methyl.
11. A compound as claimed in claim 1 or 2, wherein  $R^4$  is hydrogen or halo.
12. A compound as claimed in claim 1 or 2, wherein In a preferred embodiment,  $R^4$  is hydrogen.
13. A compound as claimed in claim 1 or 2, wherein  $Q_1$  is hydrogen, halo,  $C_1-C_2$  alkyl or  $C_1-C_2$  alkoxy.
14. A compound as claimed in claim 1 or 2, wherein  $Q_1$  is hydrogen, chloro, methyl, or methoxy.
15. A compound as claimed in claim 1 or 2, wherein  $Q_2$  is  $A^1$  and  $Q_3$  is  $A^2$ .
16. A compound as claimed in claim 1 or 2, wherein  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^1$ .



17. A compound as claimed in claim 1 or 2, wherein  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^1$ , wherein  $A^1$  is hydrogen, halo, or  $C_1$ - $C_3$  haloalkyl and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein  $Z$  is  $CH_2$  and  $m$  is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is  $C_1$ - $C_4$  alkyl or  $NR^8R^9$  and wherein  $R^8$  is hydrogen  $C_1$ - $C_4$ alkyl, or alkoxy and  $R^9$  is hydrogen,  $C_1$ - $C_4$ alkyl, or alkoxy.

18. A compound as claimed in claim 1 or 2, wherein  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^1$ , wherein  $A^1$  is hydrogen or chloro and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein  $Z$  is  $CH_2$  and  $m$  is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is methyl or  $-NH_2$ .

19. A compound as claimed in claim 1 or 2, wherein  $Q_2$  is  $A^1$  and  $Q_3$  is  $A^2$ , wherein  $A^1$  is hydrogen, halo, or  $C_1$ - $C_3$  alkyl and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein  $Z$  is  $CH_2$  and  $m$  is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is  $C_1$ - $C_4$  alkyl or  $NR^8R^9$ , and wherein  $R^8$  is hydrogen  $C_1$ - $C_4$ alkyl, or alkoxy and  $R^9$  is hydrogen,  $C_1$ - $C_4$ alkyl, or alkoxy.

20. A compound as claimed in claim 1 or 2, wherein  $Q_2$  is  $A^1$  and  $Q_3$  is  $A^2$ , wherein  $A^1$  is hydrogen, methyl, or chloro and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , wherein  $Z$  is  $CH_2$  and  $m$  is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is  $NR^8R^9$ , wherein  $R^8$  is methoxy and  $R^9$  is hydrogen.

21. A compound as claimed in claim 1, wherein,  $D$  is  $-NRR^1$ , where  $R$  is  $C_1$ - $C_8$  alkyl, aryl, or aralkyl and  $R^1$  is hydrogen;  $R^2$  is  $C_1$ - $C_8$  alkyl.  $R^2$  is methyl;  $R^3$  is methyl;  $R^4$  is hydrogen;  $Q_1$  is hydrogen, chloro, methyl, or methoxy;  $Q_2$  is  $A^2$  and  $Q_3$  is  $A^1$ , where  $A^1$  is hydrogen or chloro and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , where  $Z$  is  $CH_2$  and  $m$  is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is methyl or  $-NH_2$ .

22. A compound as claimed in claim 1, wherein  $D$  is  $-NRR^1$ , where  $R$  is  $C_1$ - $C_8$  alkyl, aryl, or aralkyl and  $R^1$  is hydrogen;  $R^2$  is  $C_1$ - $C_8$  alkyl.  $R^2$  is methyl;  $R^3$  is methyl;  $R^4$  is hydrogen;  $Q_1$  is hydrogen, chloro, methyl, or methoxy;  $Q_2$  is  $A^1$  and  $Q_3$  is  $A^2$ , where  $A^1$  is hydrogen, methyl, or chloro and  $A^2$  is the group defined by  $-(Z)_m-(Z^1)-(Z^2)$ , where  $Z$  is  $CH_2$  and  $m$  is 0 or 1;  $Z^1$  is  $S(O)_2$ ; and  $Z^2$  is  $NR^8R^9$ , where  $R^8$  is methoxy and  $R^9$  is hydrogen.

23. A compound as claimed in claim 1, selected from the group consisting of:

*N*<sup>2</sup>-isopropyl-*N*<sup>5</sup>,1-dimethyl-*N*<sup>5</sup>-[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1*H*-benzimidazole-2,5-diamine;

*N*<sup>2</sup>-isopropyl-*N*<sup>5</sup>,1-dimethyl-*N*<sup>5</sup>-[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1*H*-benzimidazole-2,5-diamine;

1-{4-[(4-{methyl[1-methyl-2-(methylamino)-1*H*-benzimidazol-5-yl]amino}pyrimidin-2-yl)amino]phenyl}methanesulfonamide;

*N*<sup>2</sup>-benzyl-*N*<sup>5</sup>,1-dimethyl-*N*<sup>5</sup>-[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-1*H*-benzimidazole-2,5-diamine;

*N*<sup>5</sup>,1-dimethyl-*N*<sup>5</sup>-[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]-*N*<sup>2</sup>-phenyl-1*H*-benzimidazole-2,5-diamine; and

5-({4-[[2-(benzylamino)-1-methyl-1*H*-benzimidazol-5-yl](methylamino)pyrimidin-2-yl}amino)-*N*-methoxy-2-methylbenzenesulfonamide;

or a salt, solvate, or physiologically functional derivative thereof.

24. A compound as claimed in claim 1, selected from the group:

3-{4-[(2-benzylamino-1-methyl-1*H*-benzimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

5-{4-[(2-benzylamino-1-methyl-1*H*-benzimidazol-5-yl)-methyl-amino]-pyrimidinylamino}-2-methyl-benzenesulfonamide;

(4-{4-[(2-benzylamino-1-methyl-1*H*-benzimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;

2-(4-{4-[(2-benzylamino-1-methyl-1*H*-benzimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide;

3-(4-{[2-(4-fluoro-benzylamino)-1-methyl-1*H*-benzimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

5-(4-{[2-(4-fluoro-benzylamino)-1-methyl-1*H*-benzimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;

*N*<sup>2</sup>-(4-fluoro-benzyl)-*N*<sup>6</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>6</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

[4-(4-{[2-(4-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;

2-[4-(4-{[2-(4-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide;

3-(4-{[2-(4-methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

5-(4-{[2-(4-methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;

*N*<sup>6</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>2</sup>-(4-methoxy-benzyl)-1, *N*<sup>6</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

[4-(4-{[2-(4-methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;

2-[4-(4-{[2-(4-methoxy-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide;

5-(4-{[2-(3-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;

3-(4-{[2-(3-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

*N*<sup>2</sup>-(3-fluoro-benzyl)-*N*<sup>6</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>6</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

[4-(4-{[2-(3-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;

2-[4-(4-{[2-(3-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide;

3-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

5-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;

2-[4-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-ethanesulfonic acid methylamide;

*N*<sup>2</sup>-(4-chloro-benzyl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

3-{4-[(2-benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

5-{4-[(2-benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-2-methyl-benzenesulfonamide;

*N*<sup>2</sup>-benzyl-1-ethyl-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>5</sup>-methyl-1H-benzoimidazole-2,5-diamine;

(4-{4-[(2-benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;

3-(4-{[2-(2-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylmethyl)-benzenesulfonamide;

5-(4-{[2-(2-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;

[4-(4-{[2-(2-fluoro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;

2-(4-{4-[(2-benzylamino-1-ethyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide;

3-(4-{methyl-[1-methyl-2-(1-phenyl-ethylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

2-methyl-5-(4-{methyl-[1-methyl-2-(1-phenyl-ethylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine;

[4-(4-{methyl-[1-methyl-2-(1-phenyl-ethylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;

3-(4-{[2-(3-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

3-(4-{[2-(3-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

[4-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;

methanesulfonic acid-3-(4-{[2-(4-chloro-benzylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl ester;

$N^5$ -{2-[4-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxybenzyl)-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^5$ -{2-[3-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxybenzyl)-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^5$ -{2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}- $N^2$ -(4-methoxybenzyl)-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^5$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^2$ -(4-methoxybenzyl)-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -benzyl- $N^5$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^5$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine;

$N^5$ -{2-[3-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,  $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine;

$N^5$ -{2-[4-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,  $N^5$ -dimethyl- $N^2$ -(1-phenyl-ethyl)-1H-benzoimidazole-2,5-diamine;

2-methyl-5-(4-{methyl-[1-methyl-2-(4-methyl-benzylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

$N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine;

$N^5$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine;

$N^5$ -{2-[4-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,  $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine;

$N^5$ -{2-[3-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,  $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine; and

$N^5$ -{2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1,  $N^5$ -dimethyl- $N^2$ -(4-methyl-benzyl)-1H-benzoimidazole-2,5-diamine;

or a salt, solvate, or physiologically functional derivative thereof.

25. A compound as claimed in claim 1, selected from the group:

(1-methyl-5-{methyl-[2-(3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-phenyl-carbamic acid tert-butyl ester;

3-{4-[methyl-(1-methyl-2-phenylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

(1-methyl-5-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-phenyl-carbamic acid tert-butyl ester;

*N*<sup>6</sup>-[2-(3-methanesulfonyl-4-methyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>6</sup>-dimethyl-*N*<sup>2</sup>-phenyl-1H-benzoimidazole-2,5-diamine;

*N*<sup>6</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>6</sup>-dimethyl-*N*<sup>2</sup>-phenyl-1H-benzoimidazole-2,5-diamine;

(4-{4-[methyl-(1-methyl-2-phenylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;

methanesulfonic acid 4-{4-[methyl-(1-methyl-2-phenylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl ester;

3-(4-{[2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

5-(4-{[2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;

*N*<sup>2</sup>-(4-fluoro-phenyl)-*N*<sup>6</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>6</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

[4-(4-{[2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;

methanesulfonic acid 4-(4-{[2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl ester;

methanesulfonic acid 3-(4-{[2-(4-fluoro-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl ester;

*N*<sup>6</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>6</sup>-dimethyl-*N*<sup>2</sup>-p-tolyl-1H-benzoimidazole-2,5-diamine;

[4-(4-{[2-(4-tert-butyl-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;

3-(4-{[2-(4-tert-butyl-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-me

thyl-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

5-(4-{[2-(4-tert-butyl-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;

*N*<sup>6</sup>-(4-tert-butyl-phenyl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester;

*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>2</sup>-(4-methoxy-phenyl)-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

(4-methoxy-phenyl)-(1-methyl-5-{methyl-[2-(4-sulfamoylmethyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-carbamic acid tert-butyl ester;

[4-(4-{[2-(4-methoxy-phenylamino)-1-methyl-1H-benzoimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-phenyl]-methanesulfonamide;

(5-{[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester;

*N*<sup>5</sup>-[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-*N*<sup>2</sup>-(4-methoxy-phenyl)-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

[5-{[2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-(4-methoxy-phenyl)-carbamic acid tert-butyl ester;

*N*<sup>5</sup>-[2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl]-*N*<sup>2</sup>-(4-methoxy-phenyl)-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine; and

*N*<sup>5</sup>-[2-[3-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl]-*N*<sup>2</sup>-(4-methoxy-phenyl)-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

or a salt, solvate, or physiologically functional derivative thereof.

26. A compound as claimed in claim 1, selected from the group:

3-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

2-chloro-5-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

5-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-2-methyl-benzenesulfonamide;

2-(4-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide;

methanesulfonic acid 4-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl ester;

methanesulfonic acid 3-{4-[(2-isopropylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl ester;

*N*<sup>2</sup>-isopropyl-*N*<sup>5</sup>-[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

3-[4-(1-methyl-2-phenethylamino-1H-benzoimidazol-5-ylamino)-pyrimidin-2-ylamino]-benzenesulfonamide;

2-methyl-5-{4-[methyl-(1-methyl-2-phenethylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

(4-{4-[methyl-(1-methyl-2-phenethylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;

*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-*N*<sup>2</sup>-phenethyl-1H-benzoimidazole-2,5-diamine;

2-(4-{4-[methyl-(1-methyl-2-phenethylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-ethanesulfonic acid methylamide;

*N*<sup>2</sup>-tert-Butyl-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

*N*<sup>2</sup>-cyclohexyl-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

5-{4-[(2-cyclohexylamino-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-2-methyl-benzenesulfonamide;

*N*<sup>2</sup>-cyclohexyl-*N*<sup>5</sup>-{2-[3-(2-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

*N*<sup>2</sup>-cyclohexyl-*N*<sup>5</sup>-{2-[4-(2-methanesulfonyl-ethyl)-phenylamino]-pyridin-4-yl}-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;

*N*<sup>2</sup>-cyclohexyl-*N*<sup>5</sup>-{2-[4-(1-methanesulfonyl-ethyl)-phenylamino]-pyrimidin-4-yl}-1, *N*<sup>5</sup>-dimethyl-1H-benzoimidazole-2,5-diamine;



2-methyl-5-{4-[methyl-(1-methyl-2-methylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

(4-{4-[methyl-(1-methyl-2-methylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;

3-{4-[methyl-(1-methyl-2-methylamino-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

$N^6$ -[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^2$ ,  $N^6$ -trimethyl-1H-benzoimidazole-2,5-diamine; and

(4-{4-[(1-ethyl-2-methylamino-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-phenyl)-methanesulfonamide;

or a salt, solvate, or physiologically functional derivative thereof.

27. A compound as claimed in claim 1, selected from the group:

$N^1$ -methyl- $N^5$ -[2-(4-Methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^5$ -methyl- $N^2$ -(4-trifluoromethyl-phenyl)-1H-benzoimidazole-2,5-diamine;

$N^2$ -(3-chloro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(4-chloro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2,4-dichloro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2,5-dichloro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2-chloro-4-trifluoromethyl-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2-chloro-5-trifluoromethyl-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl- $N^2$ -(4-morpholin-4-yl-phenyl)-1H-benzoimidazole-2,5-diamine;

$N^2$ -(3-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2,4-difluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2-chloro-4-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(4-chloro-2-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2-chloro-5-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2-fluoro-4-methyl-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2-fluoro-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

$N^2$ -(2-fluoro-5-trifluoromethyl-phenyl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl-1H-benzoimidazole-2,5-diamine;

4-{4-[methyl-(1-methyl-2-methylsulfanyl-1H-benzoimidazol-5-yl)-amino]-pyrimidin-2-ylamino}-benzene sulfonamide;

4-{4-[(2-methanesulfinyl-1-methyl-1H-benzoimidazol-5-yl)-methyl-amino]-pyrimidin-2-ylamino}-benzenesulfonamide;

4-(4-{methyl-[1-methyl-2-(4-trifluoromethyl-phenylamino)-1H-benzoimidazol-5-yl]-amino}-pyrimidin-2-ylamino)-benzenesulfonamide;

(methyl-nitro-1H-benzoimidazol-2-yl)-(3-trifluoromethyl-phenyl)-amine;

(methyl-nitro-1H-benzoimidazol-2-yl)-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester;

(amino-methyl-1-benzoimidazol-2-yl)-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester;

[(2-chloro-pyrimidin-4-yl)-methyl-amino]-methyl-1H-benzoimidazol-2-yl)-(3-trifluoromethyl-phenyl)-carbamic acid dimethyl-ethyl ester; and

$N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]- $N^1, N^5$ -dimethyl- $N^2$ -(3-trifluoromethyl-phenyl)-1H-benzoimidazole-2,5-diamine;

or a salt, solvate, or physiologically functional derivative thereof.

28. A compound as claimed in claim 1, selected from the group:

$N^2$ -(5-tert-butyl-isoxazol-3-yl)- $N^5$ -[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1,  $N^5$ -dimethyl-1H-methyl-amino-benzoimidazole-2,5-diamine;

*N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1H-benzimidazole-2,5-diamine;

*N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1H-benzimidazole-2,5-diamine;

*N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-1, *N*<sup>5</sup>-dimethyl-1H-benzimidazole-2,5-diamine;

*N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-*N*<sup>5</sup>-[2-(3-methanesulfonyl-4-methyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1H-benzimidazole-2,5-diamine;

5-(4-{[2-(5-tert-butyl-isoxazol-3-ylamino)-1-methyl-1H-benzimidazol-5-yl]-methyl-amino}-pyrimidin-2-ylamino)-2-methyl-benzenesulfonamide;

*N*<sup>2</sup>-(6-fluoro-4-H benzo[1,3]dioxin-8-ylmethyl)-*N*<sup>5</sup>-[2-(3-methanesulfonyl-4-methyl-phenylamino)-pyrimidin-4-yl]-1-methyl-1H-benzimidazole-2,5-diamine; and

*N*<sup>2</sup>-(5-tert-butyl-isoxazol-3-yl)-1-methyl-*N*<sup>5</sup>-[2-(3-(morpholine-4-sulfonyl)-phenylamino)-pyrimidin-4-yl]-1H-benzimidazole-2,5-diamine;

or a salt, solvate, or physiologically functional derivative thereof.

29. A compound as claimed in claim 1, selected from the group:

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)-*N'*-phenylurea;

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)benzamide;

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)indoline-1-carboxamide;

*N*-(5-tert-butylisoxazol-3-yl)-*N'*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)urea;

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)-2-phenylacetamide;

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)-1-phenylcyclopropanecarboxamide;

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)isonicotinamide;

*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)cyclohexanecarboxamide;

2-(benzyloxy)-*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)acetamide;

2-(3-methylisoxazol-5-yl)-*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)acetamide; and

3-[(dimethylamino)methyl]-*N*-(1-methyl-5-{methyl[2-({4-[(methylsulfonyl)methyl]phenyl}amino)pyrimidin-4-yl]amino}-1H-benzimidazol-2-yl)benzamide;

or a salt, solvate, or physiologically functional derivative thereof.

30. A compound as claimed in claim 1, selected from the group:

*N*-({[3-(4-methanesulfonylmethyl-phenylamino)-phenyl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-C-thiophen-2-yl-acetamide;

C-fluoro-*N*-({[3-(3-methanesulfonylmethyl-phenylamino)-phenyl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-trifluoromethyl-benzamide;

difluoro-*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-benzamide;

*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-3,5-bis-trifluoromethyl-benzamide;

cyclohexanecarboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-amide;

*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-methyl-benzamide;

*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-4-methoxy-benzamide;

C-(chloro-trifluoromethyl-phenyl)-*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-acetamide;

(3,5-bis-trifluoromethyl-phenyl)-*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-acetamide;

*N*-(5-{[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-2-(3-trifluoromethylsulfanyl-phenyl)-acetamide;

(2,4-bis-trifluoromethyl-phenyl)-*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

(2-fluoro-5-trifluoromethyl-phenyl)-*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

3H-benzotriazole-5-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

3H-benzoimidazole-5-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

thiophene-2-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

thiophene-3-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-C-thiophen-2-yl-acetamide;

3-methyl-thiophene-2-carboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

furan-3-carboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

3-methyl-furan-2-carboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-2-(3-methyl-isoxazol-5-yl)-acetamide;

C-(chloro-trifluoromethyl-phenyl)-*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

*N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-2-(3-trifluoromethylsulfanyl-phenyl)-acetamide;

C-(fluoro-trifluoromethyl-phenyl)-*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-dimethyl-butyramide;

2-propyl-pentanoic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-isobutyramide;

cyclopropanecarboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-4-methoxy-benzamide;

4-methoxy-*N*-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-benzamide;

furan-2-carboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

*N*-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-C-thiophen-2-yl-acetamide;

C-(chloro-trifluoromethyl-phenyl)-*N*-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-acetamide;

4-methoxy-*N*-[methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-benzamide;

*N*-[methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-C-thiophen-2-yl-acetamide;

thiophene-2-carboxylic acid [methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide;

furan-2-carboxylic acid [methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide;

*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-2-(3-methyl-isoxazol-5-yl)-acetamide;

furan-2-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

2-(3-methyl-isoxazol-5-yl)-*N*-[methyl-(methyl-{2-[3-(morpholine-4-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-acetamide;

3-methyl-furan-2-carboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

*N*-[methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-C-thiophen-2-yl-acetamide;

thiophene-2-carboxylic acid [methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide;

furan-2-carboxylic acid [methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-amide;

2-(3-methyl-isoxazol-5-yl)-*N*-[methyl-(methyl-{2-[3-(4-methyl-piperazine-1-sulfonyl)-phenylamino]-pyrimidin-4-yl}-amino)-1H-benzoimidazol-2-yl]-acetamide;

*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-dimethyl-butyramide;

*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-propionamide;

pentanoic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

*N*-({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-butyramide;

phenyl- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

phenylcyclopropanecarboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

1-(2,5-difluoro-phenyl)-cyclopropanecarboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

1-(4-chloro-phenyl)-cyclopropanecarboxylic acid ({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

2-(4-fluoro-phenyl)- *N* -({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

(3,5-bistrifluoromethyl-phenyl)- *N* -({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

(3,4-dichlorophenyl)- *N* -({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

1-(2,5-difluorophenyl)-cyclopropanecarboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

(2,5-difluorophenyl)- *N* -({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

(3,4-dichlorophenyl)- *N* -({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

1-(2,5-difluorophenyl)-cyclopropanecarboxylic acid ({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

(2,5-difluorophenyl)- *N* -({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

1-(3,4-dichlorophenyl)-cyclopropanecarboxylic acid ({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

3,4-dichlorophenyl- *N* -({[2-(5-ethanesulfonyl-2-methoxy-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

1-(2,5-difluorophenyl)-cyclopropanecarboxylic acid (methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-amide;



1-(3,4-dichlorophenyl)-cyclopropanecarboxylic acid (methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-amide;

(3,4-dichlorophenyl)- *N*-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-acetamide;

2-(2,3-dimethoxyphenyl)- *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;

2-(2-methoxyphenyl)- *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;

2-(3-methoxyphenyl)- *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;

2-(3-methoxyphenyl)- *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;

2-(2-fluorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

2-(3-fluorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

(2,5-difluorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

(2,3-difluorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

2-(3,4-dimethoxyphenyl)- *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzoimidazol-2-yl)-acetamide;

(2,5-difluorophenyl)- *N*-(methyl-{methyl-[2-(4-methyl-3-sulfamoyl-phenylamino)-pyrimidin-4-yl]-amino}-1H-benzoimidazol-2-yl)-acetamide;

1-(3,4-dichloro-phenyl)-cyclopropanecarboxylic acid ({[2-(3-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-amide;

2-(2-chlorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzoimidazol-2-yl)-acetamide;

2-(3-chlorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-acetamide;

2-(4-chlorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-acetamide;

2-(3,5-dimethoxyphenyl)- *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzimidazol-2-yl)-acetamide;

2-(2,5-dimethoxyphenyl)- *N*-(5-{[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-1-methyl-1H-benzimidazol-2-yl)-acetamide;

(2,5-dichlorophenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-acetamide;

*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-methyl-C-phenyl-butyramide;

(3,5-dimethylphenyl)- *N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-acetamide;

*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)- phenyl-isobutyramide; and

benzo[1,3]dioxol-5-yl-*N*-({[2-(4-methanesulfonylmethyl-phenylamino)-pyrimidin-4-yl]-methyl-amino}-methyl-1H-benzimidazol-2-yl)-acetamide;

or a salt, solvate, or physiologically functional derivative thereof.

31. A pharmaceutical composition, comprising: a therapeutically effective amount of a compound as claimed in any one of claims 1 to 30, or a salt, solvate, or a physiologically functional derivative thereof and one or more of pharmaceutically acceptable carriers, diluents and excipients.

32. The pharmaceutical composition of claim 31, further comprising at least one additional anti-neoplastic agent.

33. The pharmaceutical composition of claim 31, further comprising an additional agent which inhibits angiogenesis.

34. A method of treating a disorder in a mammal, said disorder being mediated by at least one of inappropriate TIE-2 and VEGFR-2 activity, comprising: administering to said mammal a therapeutically effective amount of a compound as claimed in any one of claims 1 to 30, or a salt, solvate, or a physiologically functional derivative thereof.
35. The method of claim 34, wherein the disorder is cancer.
36. A compound as claimed in any of claims 1 to 30, or a salt, solvate, or a physiologically functional derivative thereof for use in therapy.
37. Use of a compound as claimed in any of claims 1 to 30, or a salt, solvate, or a physiologically functional derivative thereof in the preparation of a medicament for use in the treatment of a disorder mediated by at least one of inappropriate TIE-2 and VEGFR-2 activity.
38. The use of claim 37, wherein the disorder is cancer.
39. A method of treating cancer in a mammal, comprising: administering to said mammal a therapeutically effective amount of a compound as claimed in any one of claims 1 to 30, or a salt, solvate, or a physiologically functional derivative thereof.
40. The method of claim 39, further comprising administering a therapeutically effective amount of at least one additional anti-cancer therapy.
41. The method of claim 40, wherein the additional anti-cancer therapy is administered concomitantly with the administration of the compound, salt, solvate or physiologically functional derivative as claimed in any one of claims 1 to 30.
42. The method of claim 40, wherein the additional anti-cancer therapy is administered after the administration of the compound, salt, solvate or physiologically functional derivative as claimed in any one of claims 1 to 30.

43. The method of claim 40, wherein the additional anti-cancer therapy is administered before the administration of the compound, salt, solvate or physiologically functional derivative as claimed in any one of claims 1 to 30.
44. A method of treating a disorder in a mammal, said disorder being mediated by at least one of inappropriate TIE-2 and VEGFR-2 activity, comprising: administering to said mammal therapeutically effective amounts of (i) a compound as claimed in any one of claims 1 to 30, or a salt, solvate or physiologically functional derivative thereof and (ii) an agent to inhibit growth factor receptor function.
45. The method of claim 44, wherein the agent to inhibit growth factor receptor function inhibits the function of platelet derived growth factor receptor.
46. The method of claim 44, wherein the agent to inhibit growth factor receptor function inhibits the function of epidermal growth factor receptor.
47. The method of claim 44, wherein the agent to inhibit growth factor receptor function inhibits the function of the erbB2 receptor.
48. The method of claim 44, wherein the agent to inhibit growth factor receptor function inhibits the function of a VEGF receptor.
49. The method of claim 44, wherein the agent to inhibit growth factor receptor function inhibits the function of the TIE-2 receptor.
50. The method of claim 44, wherein the agent to inhibit growth factor receptor function inhibits the function of the epidermal growth factor receptor and erbB2.
51. The method of claim 44, wherein the agent to inhibit growth factor receptor function inhibits the function of at least two of the epidermal growth factor receptor, erbB2, and erbB4.

52. The method of claim 44, wherein the agent to inhibit growth factor receptor function inhibits the function of the VEGF receptor and the TIE-2 receptor.
53. The method of claim 44, wherein the disorder is cancer.
54. A method of treating a disorder in a mammal, said disorder being characterized by inappropriate angiogenesis, comprising: administering to said mammal a therapeutically effective amount of a compound as claimed in any one of claims 1 to 30, or a salt, solvate or physiologically functional derivative thereof.
55. The method of claim 54, wherein the inappropriate angiogenesis results from at least one of inappropriate VEGFR1, VEGFR2, VEGFR3 or TIE-2 activity.
56. The method of claim 54, wherein the inappropriate angiogenesis results from inappropriate VEGFR2 and TIE-2 activity.
57. The method of claim 54, further comprising administering a therapeutically effective amount of a VEGFR2 inhibitor.
58. The method of claim 54, wherein the compound as claimed in any one of claims 1 to 17 inhibits TIE-2 and VEGFR-2 activity.
59. The method of claim 54, wherein the disorder is cancer.
60. Use of a compound as claimed in any of claims 1 to 30, or a salt, solvate, or a physiologically functional derivative thereof in the preparation of a medicament for use in the treatment of a disorder characterized by inappropriate angiogenesis.

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 C07D403/12 C07D401/14 C07D403/14 C07D405/14 C07D409/14  
C07D413/14 A61K31/506 A61P35/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C07D A61K A61P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, BEILSTEIN Data, CHEM ABS Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 97 19065 A (CELLTECH THERAPEUTICS LIMITED) 29 May 1997 (1997-05-29) the whole document, particularly example 101	1-60
Y	WO 00 12089 A (MERCK & CO., INC.) 9 March 2000 (2000-03-09) the whole document	1-60
P,Y	WO 02 059110 A (GLAXO GROUP LIMITED) 1 August 2002 (2002-08-01) the whole document, particularly examples 74 and 75	1-60

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

**° Special categories of cited documents :**

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

6 June 2003

Date of mailing of the international search report

25/06/2003

Name and mailing address of the ISA

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Authorized officer

Allard, M

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 03/06022

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:  
  
Although claims 34, 35, 39-59 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
2. ☒ Claims Nos.: 1, 2, 23-60 (all in part)  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 1, 2, 23-60 (all in part)

The scope of claims 1, 2 and 23-60, in as far as the expression "physiologically functional derivative" is concerned, is so unclear (Article 6 PCT) that a meaningful international search is impossible with regard to this expression.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.



Patent document cited in search report		Publication date		Patent family member(s)		Publication date
WO 9719065	A	29-05-1997	AK	7631496	A	11-06-1997
			DE	69627179	D1	08-05-2003
			EP	0862560	A1	09-09-1998
			WO	9719065	A1	29-05-1997
			US	6235746	B1	22-05-2001
			US	5958935	A	28-09-1999
WO 0012089	A	09-03-2000	AU	3078999	A	21-03-2000
			CA	2341409	A1	09-03-2000
			EP	1109555	A1	27-06-2001
			JP	2002523459	T	30-07-2002
			WO	0012089	A1	09-03-2000
			US	6162804	A	19-12-2000
			US	6465484	B1	15-10-2002
WO 02059110	A	01-08-2002	WO	02059110	A1	01-08-2002

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